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A MANUAL OF ANÆSTHETICS:
THEORETICAL AND PRACTICAL.

ROYAL COLLEGE OF SURGEONS OF ENGLAND
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A MANUAL
OF
ANÆSTHETICS:

Theoretical and Practical.

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—
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TO DR E. BROWN-SÉQUARD.

MY DEAR SIR,

As one who feels indebted for many kindnesses, and for much information during your stay in England, I feel great pleasure in dedicating this little volume to the chief interpreter and physiologist of the Nervous System. I would only fain couple with your name that of the Hospital Surgeons of London, amongst whom, as a class, I have also found the same kindness, the same good feeling, truthfulness, and professional zeal, and I am sure, in dedicating it to you, whom they so much applaud and admire, I am dedicating it to them.

Believe me,

Yours, very faithfully,

CHARLES KIDD.

SACKVILLE STREET, LONDON,
October, 1858.

“ Man's reason being created after the image of God, he has to use it to discover the laws by which the Almighty governs his creation ; and by making these laws his standard of action to conquer Nature to his use—himself a Divine instrument.”—*Speech of H. R. H. the PRINCE CONSORT, at the Mansion House.*

“ ‘ Truth is fruitful and falsehood barren,’ whilst the discoveries of the science of the imponderable forces have produced the lightning conductor and the electric telegraph, what fruits have we of clairvoyance or table turning? Astrology was a counterfeit of the truer science of astronomy, and alchemy of chemistry:—apply the test of fruitfulness, and you find falsehood barren, but truth fruitful. You can all readily make the application for yourselves ; thus I would invite you also to compare the rapid development in point of utility in our own day of CHLOROFORM, as contrasted with the older discoveries of a like kind.”—*Address of Vice-Chancellor PAGE WOOD, on the “ Tests of Truth.”*

ADVERTISEMENT.

THE early portion of the following Manual is devoted, as it ought to be in historic order, to the subject of sulphuric ether, or, as it is now more properly termed, "æther;" the second part of that division of the work to chloroform: whilst in the Summary, or concluding abstract, an effort has been made to fix the dose and value of each, respectively, as anæsthetic agents. All the essential facts connected with the "stages" of anæsthesia, the various operations where chloroform is now given in moderately large, and where in small doses; the preparatory treatment of patients; the best rules for resuscitation in impending death from anæsthetics, &c., will be found succinctly given.

From the month of October, 1846, and the discovery in America of the anæsthetic properties of æther, we must date a hopeful and new era in operative surgery, as remarkable, perhaps, as that which succeeded the happy invention to tie arteries after ampu-

tations, or to vaccinate as a prophylactic for small-pox. Chloroform, first made in 1831, and recommended by Simpson in 1847, was a manifest improvement on *Æther* as used in 1846. We are still acting as watchers by the cradle of anæsthetics: this new birth of our time, glorious and beautiful already in promise, has still many of the imperfections, and all or much of the unshapeliness of a new birth. Direful gossips have boded much evil for chloroform; and, as in the case of Harvey's discovery, or the great deed done by Jenner, the most clangorous noise has come from our own friends inside the Profession. This is referred to with pain, but of necessity, as we were called on to show how devoid of foundation all such auguries have proved.

It may be objected that this treatise is unsystematic,—every subject scattered up and down, without that dextrous finish that the true essayist would give it; but this I believe is a recommendation. The careful experiments of the late Dr Snow, and my own not very limited experience of the administration of chloroform in hospital and private practice, for the last ten years, have furnished me with a collection of notes and facts, ideas and half-ideas jotted down in

hospitals, for the most part at the time and on the instant, that appear to me more valuable than even a republishing of any the largest collection of old controversies or older essays, though ever so finished. Something, too, of a better logic is now abroad on the subject. Nearly all our best medical philosophy is, now-a-days, a reasoning from particulars to particulars: we have now no imaginary first principles, phlogiston, or astrological influences, spirits in the arteries, vis medicatrix, or the imaginary combustion of common inflammation to deal with,—our best clinical facts are deductive. It is found that a passion for generalisation (induction) in the physiological sciences, leads back—and by no very devious path, too—to things like phlogiston, Hahnemannism, Brunonism, &c. The chief use of syllogisms in anæsthetics is to prevent error, inconsistency, and contradiction. A syllogism, after all, obtains for us nothing new. Various things containing cells are cancers; some or various deaths from chloroform are noted where fatty heart existed; all cancers contain cells—all fatty-heart cases are suspicious; are only inferences drawn according to the previous formulæ. But what would be more erroneous than for us to say all growths with

cells are cancerous? and, as has been often said, all deaths from chloroform are from fatty heart. Of late it is even found necessary to give what is called a "quantificative" value to certain pathological facts; and it is said a patient with fatty heart incurs a certain appreciable or definite decimal of danger from chloroform, but that is all.

Accidents, only or chiefly, in the early stages of anæsthesia,—accidents also in the fourth stage of chloroform, though not suspected by Dr Snow, are now beginning to be recognised in hospital practice, as well as the truth and value of what is called the "law of tolerance," deduced from simple observation of large numbers of patients under anæsthetics, or reasoning from particulars to particulars. It is as nothing to the true observer, if he be derided, for not seeing into the mill-stone of some one grand law or arcanum in chloroform; but we must be content for a while with the teachings of clinical experience. Deaths from chloroform have been much overrated as to their frequency; it has been a troubled struggle for us to strive to arrive at the truth on this point. Velpeau and Magendie, within our recollection, looked on anæsthetics as a chimera and an impossibility. The field

of anæsthetics, generally, as might be expected, is overrun with errors, with which we have had to contend. It is a good and satisfying work, however, to prevent the growth of electric and other heresies in anæsthetics ; it is a work of danger to pick out the false facts, to destroy the tares out of the wheat, out of the coming harvest field of anæsthetics. The true value of chloroform in some branches of practice, such as obstetrics, has never been estimated before, and on this, at the conclusion of this work, much attention has been bestowed. In fine, we should begin to look on "pain" in surgery as a great evil ; it may lessen the brilliancy of some operations, or take from obstetrics much of its awe to do so, but still it is an evil of no slight magnitude, nevertheless.

This book is dedicated, with no misgivings, to the students and hospital surgeons of the London school : it may disappoint them as it has disappointed myself, but it is to be taken for what it is worth. For the young men I have great faith and much love : I have spent ten years amongst them. My leading object in raking up old errors and weaknesses is to show how much need we have of a more correct logic as to the nature of pain, and of

gentler thoughts and a less rigid dogmatism amongst our cotemporary essayists. I can love the young people,—the old are not so lovely; but the red-hot knives and boiling-oil school is at an end for ever. Nor is this suffering and experience of past medical errors and fallacies without its usefulness, if it beget in us more sympathy for the sick, as it cannot fail to do, and more true greatness and a higher estimate of the blessings of chloroform when judiciously administered; if it beget in us a modest yielding to established facts, which show that chloroform is not a chimera, but a beautiful reality in its power of assuaging pain. Nor is the study of consciousness and pain which the subject of anæsthetics inculcates without its purifying and religious agency also, if it make us more observant of the beauty and fulness, and depth and development of this consciousness, which in its healthy state holds together the whole framework of the social world; which in its diseased condition or pain, it is our first, last duty, our ever-recurring task as medical men, to relieve; but which we were never permitted to do so effectually as since the discovery and application of chloroform.

P R E F A C E.

SOME friends will probably recognise in the present little book the metamorphosed chrysalis of a former edition of a smaller work of the same kind. So much the better. The administration of chloroform, though a comparatively new, is an ever-changing subject of study, in which the mere bookworm is of little use, except he bring, year after year, his theories to bear on actual facts, as observed in the "fresh fields and pastures new" of the domain of Nature. Our best knowledge of consciousness on the side of the nervous system, as well as our best anatomy of the nervous system itself, are new; we were never before in such a position to understand or explain the action of chloroform, while, on the other hand, in the unequalled beauty of the metaphysical writings of such men as Locke and Schlegel, the giant writers of former years; Emerson, Carpenter, Mill, and Sir H. Holland, still amongst us—we find ever recurring new light to clear up the dark places of chloroform, more especially in its

relation with emotions and the finer actions of the nervous system on the Soul.

It may be and often is objected, that though chloroform is a new, if not ephemeral, it is also a very diminutive subject, scarcely deserving of much attention—that, in a word, any unqualified nurse or assistant with common steadiness of hand may administer it. No doubt chloroform is a small subject : I have made a small book on purpose as a sort of manual ; still, as engaging medical men with the study and phenomena of consciousness and the relation of external sensations to ideas in the mind, it is a subject of the very deepest interest, and one, if I mistake not, destined before long to shed some clearer and broader light on psychological medicine and the general phenomena of nervous and mental diseases.

We are still, as regards the mass of the Profession, too much inclined also to look on chloroform inhalation as a sort of lottery—in which it signifies very little whether good or bad ether or chloroform be used—or in how large or how small quantities either of these agents be administered, so that a certain steadiness of hand and inexpensive rule of mere imitation be learned from the out-patients' department of our larger hospitals. But mere steadiness of hand and imitation will not answer in doubtful cases ; and a small work like the present, ready in every

way to chronicle every improvement as it arises, must prove more desirable than may at first sight appear.

Lord Bacon says. every man is to be believed in his own Art, and that it is even good to seek help through such aids as rules of science, and something more than steadiness of hand afford,—“for no man,” says Bacon, “be he ever so cunning or practised, can make a mathematical straight line or perfect circle by steadiness of hand, which may be easily done by help of a ruler or compass;” which he may obtain for a few half-pence! We are beginning to arrive at some such aids or helps as regards the surgical operations adapted to each of the stages of chloroform anæsthesia; we begin to estimate the comparative value of æther and chloroform, the necessity of using perfectly pure specimens of these agents, as well as the contraindications to their use, all to be learned by study and attention of the subject rather than by chance hazard.

I have kept two classes chiefly in view in treating on these points in the following pages. One portion of the mass of persons who use chloroform are inclined to underrate the dangers attending its administration; they “think nothing of chloroform,” their rule of thumb, or making a circle by a steady sweep of hand, has been to them of more use than any auguries of evil to be found in the

daily papers. Some "think nothing of a few deaths" from chloroform; but still every conscientious man must shudder at such an idea, and think a great deal of even the chance of one single death, and labour assiduously to obviate its occurrence.

A second class, though probably excellent practitioners, have always done without chloroform, and will go on to the end of the chapter of accidents dissuading their friends from its use. "Our mothers and their mothers did without chloroform in midwifery," said a leading obstetric lecturer to me this year, "and why recommend it to our daughters or wives?" But this—which I call the "old-grandmother argument"—would apply to vaccination equally as well as to chloroform!

The chloroform assistant should be conversant with epileptic disorders, as well as auscultatory signs of disease in the lungs and heart, and he neglects a very serious duty if, in all doubtful cases, he omits to pass his ear over the thoracic walls. He should know if there be mitral disease, or dilated auricles present, or that very enigmatical disease "fatty heart." It is fortunate that chloroform in 999 cases out of a thousand, and especially in hospitals, need never be administered without the skilled ear of the physician of the hospital or family physician having been first made acquainted with what is

going on in the chest. This objection to chloroform, I am sorry to find, though of little moment, is the one that chiefly misleads in practice. The word "diseased heart" is whispered, and chloroform put aside; or, on the other hand, if any tediousness or casualty happen to occur from the surgical operation itself, it is at once set down to the account of the chloroform, and noised about by the patient's friends in no favourable manner.

Not unlike our Medical Reform in general or medical education itself, the subject of chloroform is assuming many new forms. We begin to hear of several distinct things for the first time, such as a "law of tolerance" under anæsthetics, the anticipations of the casualties under chloroform by administration of other stimulants beforehand, such as wine, brandy, opium, &c. We have now, as separate physiological facts, to study common sensation, then also the sense of "touch," the muscular sense or "muscular consciousness" of Duchêne; we have also reflex or diastaltic currents, hitherto but "airy shapes," now taking a prominent place in the prose diagrams of our every-day works on Anatomy and Medicine; we have, also, something every day of the contrasts of æther and chloroform and electricity in practice, and the wide field of mental emotions as bearing on anæsthetics; we have, also, the use of chloroform administered internally—of which I

hope to write again—where chloroform is found to be of value beyond all price. It is, however, in relation to the new, and apparently true, philosophy of the Nervous System recently worked out in France and Germany, that the effect of chloroform on sensation and consciousness, and the reflex or diastaltic system, seems of paramount importance, and the whole subject assumes a new life out of the inert book wisdom of former years.

That some such medicines as anæsthetics existed in former times, I have touched on incidentally; they were called odoraments; the references are only valuable as giving us the actions and reactions of mental and cerebral functions, as observed by such a master of human nature as Shakspeare: indeed, Friar Lawrence seems a master of the art of anæsthetics, as these were distilled from his “baleful weeds and precious juiced flowers.”

“Many for many virtues excellent,
None but for some and yet all different.
Within the infant rind of one small flower
Poison hath residence and medicine power;
For this being smelled with that smell cheers each
part,
Being tasted wounds the senses with the heart.”

And then, when Juliet requires something to put off the pain of being married against her

will, she is presented with a phial, the use of the contents of which is to be followed by

“ A cold and drowsy humour, which shall seize
Each vital spirit, for no pulse shall keep
Its natural progress, but surcease to beat.
——— no breath shall testify thou livest,
The roses in thy lips and cheeks shall fade,
And in this borrowed likeness of shrunk death
Thou shalt remain full two-and-forty hours,
And then awake as from a pleasant sleep.”

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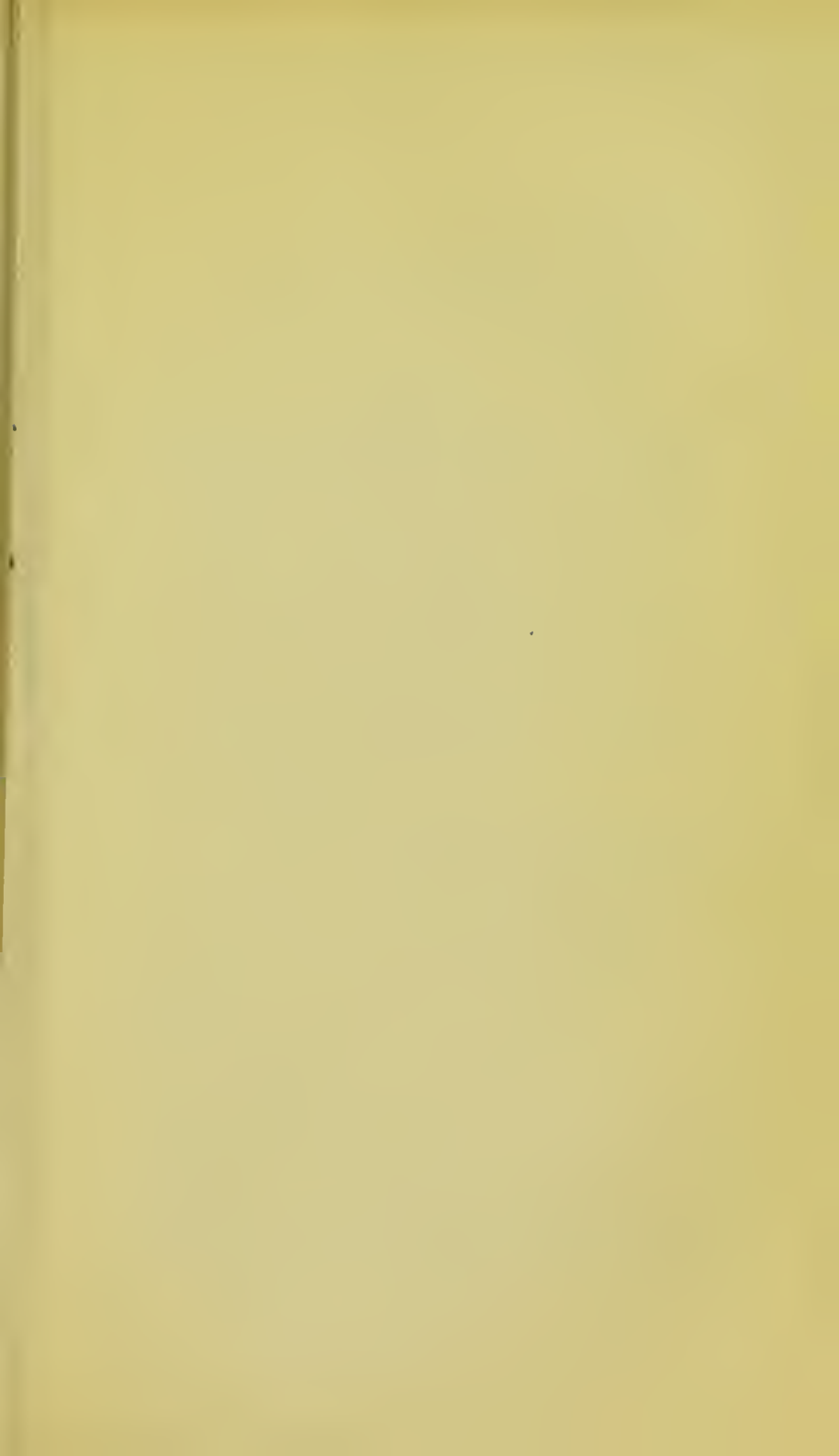
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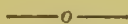
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ON ÆTHER AND CHLOROFORM.

PART I.



ON ÆTHER, &c.



CHAPTER I.

HISTORY OF ANÆSTHESIA—ARIEL—EARLY ANÆSTHETICS OF THEODORIC, 1538 — MIDDLETON, OLD ENGLISH POET, 1657 — EARLY EXPERIMENTS WITH CHLOROFORM — EFFECTS ON ANIMALS, BIRDS, LIZARDS, FROGS, FISHES—FOUR STAGES OF CHLOROFORM INTOXICATION —IMPROVED KNOWLEDGE OF THE FUNCTIONS OF THE BRAIN — THE SENSORIUM OF THE ANATOMICAL SCHOOLS AND THAT REFERRED TO BY LOCKE—CONSCIOUSNESS, AS ABOLISHED BY CHLOROFORM.

THE study of CHLOROFORM has now come to be one so essentially of observation in hospitals rather than of mere theory in books that it appears to me that the experience of ten years, derived from constantly watching the peculiarities of this agent by the bedside and in the operating theatre, may tend to some further practical elucidation of the subject.*

* In Feb. 1856, I read a paper before the Medical Society of London, in which the particular surgical operations adapted to each of the three stages of the chloroform process were indicated ; that paper, an abstract of which appears in the 'Lancet' of that date, was founded partly on what I had seen in the year 1848-9 in Paris, where I was sent by the

It is not of very much practical interest to trace the history of anæsthetics; it is believed at an early period agents not unlike chloroform were in use. In Shakspeare we have Ariel, the ideal representative of the consciousness of man's inward life—the personified genius of æther or the finer world of spirit, bringing with him a certain form of anæsthesia with which he overshadows the sailors on the island, in imitation of something, no doubt, in the old books of the period:

Alonzo. I wish mine eyes
Would with themselves shut up my
[thoughts; I find
They are inclined to do so.
Seb. It seldom visits sorrow; when it doth
It is a comforter. [asleep).
Alonzo. Wondrous heavy (*falls down*)
Seb. This is a strange repose, to be asleep
With eyes wide open; standing, speak-
[ing, moving,
And yet so fast asleep.

conductors of the 'Medical Times' to watch the progress of 1,600 surgical cases—men and women wounded in every conceivable manner by gun-shot wounds in one of the *emeutes* peculiar to that city; where I attended day by day alongside the veteran Roux, the experimental Jobert, and the experienced Velpeau, and where chloroform, which had just "come out," was being used in hundreds and hundreds of operations. I subsequently visited Germany on the same mission for the 'Medical Times,' and I have been almost continuously, since 1849, attending operations in the various London hospitals, and contrasting the effects of chloroform in each for that Journal or the 'Lancet.'

In that singular old book, 'Burton's Anatomy of Melancholy,' it is stated that a ball of opium, if inhaled or smelled-to, causes sleep; and pillows of poppies, hops, and henbane were much used at that period. A few years before the discovery of anæsthetics some noise was made in England that æther, being inhaled, had killed asthmatic or other patients, but nothing apparently was made of the fact. There is a very interesting field yet untouched perhaps—viz., the combination of different forms of anæsthetics and narcotics together. We give perhaps too much chloroform; a smaller quantity, with some modification of æther, hops, or henbane, being more safe. In a recent case of operation a patient got two grains of opium immediately preceding chloroform administration. It is well to remember that something like 14 or 15 per cent. of chloroform vapour is considered the *maximum* of this agent which air, respired by patients, can contain; a larger quantity will probably evaporate in summer than winter, but a per-centage, of even half this amount, will be exceedingly dangerous. It does not seem to find any favour with surgeons, except in case of operations on children, to mix chloroform with any other fluid—chloroform mixing badly with other fluids; yet the plan observed on the Continent of mixing æther with chloroform seems very deserving of trial, as we thus insure a certain proportion of chloroform, which, in combination with spirits of wine, should never exceed 5 per cent. in the air respired. Æther, however, is not one-fourth as active as an anæsthetic agent as chloroform is reputed to be.

Many agents that we would now designate anæs-

thetics are noticed in Pliny and Dioscorides, while even so early as the third century the dusty manuscripts of our libraries tell of a certain Chinese physician, named Moa-tho, who performed many surgical operations in this fashion. Guy de Chauliac and Theodoric speak even of anæsthetics applied by inhalation; the references to the operations of the latter by a quaint old writer in 1538 are startling and characteristic. Speaking of the mode of operating, as practised by various surgeons before that epoch, it is said some give their patients anæsthetic medicines, in order that the patients may not feel the cutting with the knife. Opium, mandragora, or succus morellæ, dipping in it a sponge, and letting this dry in the sun, and then, when used, placing this medicated sponge in hot water, which they give to the patient to inhale till sleep is produced, and when the patient is asleep the surgeon then performs the operation. [“Aucuns leur donnent medicines obdormiferes qui les endorment, afin que ne sentent incision; opium mandragoræ succus morellæ et plongent dedans esponge, et la laissent seccher au soleil, et ils mettent cette esponge en eaue chaulde et leurs donnent a odorant quilz prennent sommeil, et quant ilz sont endormis lz font l’operation.”] This Author even describes what is to be done in case this process of inhalation should prove too soporific and the anæsthetic effect should last too long, for then the patient must be sprinkled with water, and a particularly medicated vinegar, like our aromatic vinegar, should be given the patient to inhale! An old English poet, too, has often been referred to, who says he will “imitate the pity of old surgeons who, before

they show their art," first cast the patient into a sleep, and "then operate on the diseased part!" In fact the references to former anæsthetics are so common that it is possible they may again fall into oblivion.

The special action of chloroform on the inferior animals is very instructive, and seems to be in proportion to the development of the centres of the senses and of respiration—in other words, in proportion or relation to the absorbing surface for the chloroform in the lungs, and the activity of feeling, and of the general nervous system so well mapped out for us now by M. Brown-Séquard.

Birds, for instance, where the respiratory system is so perfect, are more easily affected than lizards or frogs; in birds the entire frame almost, with the cavities of the long bones, are engaged in respiration; the optic ganglia, the analogues of the tubercula quadrigemina, whence may be traced all the nerves of sensation, general and special, are soon brought under the dominion of the anæsthetic, as the latter nerves are so well developed and spread over the body.

In lizards and frogs, on the other hand, and in snakes, the specific irritation of chloroform on their large spinal cords and muscular system is more marked. Snakes, though previously torpid, are roused up by their muscles being thrown into action by chloroform. As fishes, some of these creatures breathe chiefly by gills; their brain, also, is less developed than that of the bird. The posterior end of the spinal cord in man is first rendered insensible, the complex arrangement of nerves and of cerebral grey matter about the head resist longer!

A lesson of practical import arises from this:—that, as we said before, we should observe caution in using chloroform in patients, where we have to fear badly-balanced excitability of the cord or pons varolii, as in epilepsy or hysteria, as we might increase these—as in the soldier lately in Paris, who died—in the second stage of chloroform; or if the consensual group of actions, on the other hand, are likely to be deranged by diseased cord, protracted anæsthesia in the third stage may destroy them altogether, and death follow such a condition. The emotional actions of the brain must also not be forgotten; mixed up it seems, after all, curiously enough at least in man, with the nerves of the sympathetic system; a severe fright or a severe burn may so paralyse the heart and sympathetic system, through the shock to the semilunar ganglion and emotional part of the brain, as to kill a patient, yet leave no trace behind! In chloroform, in a word, as Cullen said of typhus, “we must obviate the tendency to death;” but it is clear, before doing so, we must learn and observe in which direction the tendency is most likely to lie.

Leaving this subject at present, we have perhaps two chief points in practice to attend to—the nature of the anæsthetic we use, and the peculiar constitution of our patient before using it. From some considerable observation of several thousands of operations on persons under the influence of chloroform, both in Paris and in London, I think I may say that we did not, ten years ago, sufficiently attend to the various stages of chloroform anæsthesia, or apportion the dose of chloroform with sufficient slowness; we now read, at that second dawn of anæs-

thetics, of chloroform used by the *half-ounces* at a time; and a minute or two was thought sufficient in point of time into which all the various stages were huddled, if the operation did not end in asphyxia. It is now done (in 1858) with more caution and according to stages—the pulse and respiration being both watched, as well as the sensibility of the eye. Some surgeons, with whom I am inclined to agree, advise the patient—the stomach, of course, being empty—to be brought under the influence of chloroform in a darkened chamber, not in the streaming sunlight and agitation of the operating theatre, the patient having previously taken a little wine; very much of the over-dosing of chloroform (and it will be remembered we have had already over 100 deaths from this agent) arising, they believe, from the increased or cumulative amount necessary to dull the emotional excitement or fear of the operating theatre, added to organic or other disease already existing. This precaution of a darkened room, I cannot help believing, is very necessary to be observed where we have diseased lungs, cancer, or intense emotional agitation. It might be a question whether a very small dose of chloroform might be not more efficient, if a patient were already sleepy from morphia. The sleep of opium is perhaps not very different from the sleep of chloroform; we shout in the ears, and drag the body about, to prevent it falling into the sleep of opium; yet we too often do the same with the patient getting under the sleep of chloroform, and wonder he does not fall asleep. One often sees ingenious assistants hold a woman—plunging in the second stage of chloroform—by her poll of hair, or ears, and yet be

astonished she is not asleep ; we should remember this plunging of patients is a thing they cannot control, no more than a somnambulist can prevent himself walking into a river, or an epileptic can prevent his fits.

Chloroform acts on the system evidently in a progressive manner, and this brings us to consider at least four well-marked stages of chloroformisation marked out by nature.

If we watch an infant in which the muscular system and cerebellum are not yet very well developed getting under the effects of chloroform, we notice the first feeble struggles, and crying, gradually end in a gentle sleep ; we have here the first and third stages of chloroform well marked.

Practically there are, perhaps, only three stages : One of excitement, or as Jobert styles it " exaltation of sensibility ;" one of anæsthesia ; and a third of complete prostration ; but looking at chloroform inhalation, in a purely physiological point of view, we notice four stages, beginning with slight excitement of the cerebral lobes and cerebellum. Secondly. —Excitement, probably of the pons varolii, as shown in the plunging of patients. The third stage, called the surgical stage by some—here anæsthesia really begins ; the functions of the spinal cord are abrogated, the conjunctival surface of the eye-ball, generally so delicate, loses its sensibility ; the pupil too, I think, as a rule, contracts, and the eye turns up ; the pulse certainly gets larger and softer, whether from the anæsthesia spreading to the sympathetic, as in Bernard's experiments, and a certain relaxation of the muscular coats of the arteries taking place from chloroform, might be a

question of curious speculation. There is a *fourth* stage, but one always to be avoided; a state of helpless and complete immobility, which becomes additionally dangerous if the paleness of face or prostration of nausea also sets in to prolong this very alarming condition.

In strong muscular men, especially those who have undergone tedious irritating wounds, or suffered from disease for some time, the chloroform process—from what I have observed in hospitals—is usually a violent struggle or plunge, almost from first to last, in other words a prolonged *second* stage. The cause of this is, perhaps, that the muscular system is so well developed, and the irritability of the spinal nerves is very great. This second stage of anæsthesia under chloroform is remarkably like ordinary wine-intoxication. It is well known that some of the weakest of the Rhine wines—remarkable for their *bouquet*, or flavour like æther—also produce this species of intoxication much more readily than an equivalent of strong port or sherry or brandy.

To this second stage (so much better seen in adult men than children or women—every where that the muscular system is well developed) succeeds the *third* stage—that of general anæsthesia, or absence of feeling—beginning earlier in the inferior half of the body, or that more immediately under the influence of the uncomplicated cord or simple spinal system, but subsequently engaging the upper half of the body and the brain, more particularly the “*corpora striata*” and “*optic thalami*,” these great centres of feeling and consciousness, in fact, no lon-

ger responding, as was their wont, to the peripheral impressions of pain or touch! I have known a patient not feel the sawing of a bone or a red-hot iron as such passed round his shoulder, but he felt a blunt instrument in the one case pressing on the articulation or shoulder, or with his ears heard the saw in the other case. Patients under ice will also not feel the first incision, but feel the deeper incisions acutely, so that the anæsthesia is in all these cases more complete at the distal or peripheral end of the nervous system at the surface than at the centre. The connection yet separation of the two is also well shown in the familiar fact of erroneous sensations of limbs and toes twitching, though long amputated; here also a refracted false light, so to speak, is thrown upon the sun-dial of Locke's *tabula rasa*, the brain proper. The patient, it is true, forgets all about the operation, and as a general rule will not believe when he awakes from his anæsthesia that the operation is all over. Nay, the sensorium itself, as long since well supposed by Locke and others, becomes involved from want of a supply of ideas conveyed by the touch or other senses, "steeped so long in forgetfulness;" while the patient is in this stage he requires all our watchfulness, for it is quite idle to deny that when the sensorium (or all that part of the brain coterminous with the centre of volition in the grey matter of the cord and locus niger, with the vesicular matter of the mesocephalon and medulla oblongata) becomes affected, or its function for the moment destroyed by chloroform, it is idle to deny that the subject of experiment is not in the balance between life and death. A single

dash of cold water or a fresh blast of pure air may save him, or the absence of these hasten him into the fourth stage, that of syncope or collapse—always, I think, to be guarded against, but not always reached, and distinctly different from anæsthesia.

CHAPTER II.

COMPARATIVE VALUE OF ÆTHER AND CHLOROFORM—ÆTHER AS USED IN ITALY, AUSTRIA, AND AMERICA—THE “VIENNA ANÆSTHETIC” MODES OF ADMINISTERING CHLOROFORM—IMPORTANCE OF THE STUDY OF EMOTION!—EXPERIMENTS IN LOWER ANIMALS SOMEWHAT UNSATISFACTORY — EMOTIONS PURELY PSYCHICAL PHENOMENA.

AN ounce of chloroform per hour is the quantity generally understood to be necessary in midwifery cases, and Professor Simpson speaks of something moderate in having used in such a case six ounces of chloroform in twelve hours; he is also in favour of quick or sudden induction of anæsthesia by this agent in surgical operations! I think one of the chief objections to sulphuric æther is the enormous quantity of it which is required even in common operations, even so much as twenty ounces! It is advised by some, if the face become pale and agitated, either under æther or chloroform, to stop the inhalation; but I have, over and over again, remarked that the face usually becomes pale when vomiting is impending, so that it requires considerable experience to distinguish one condition from another—a condition of syncope from that of nau-

sea. Many persons are ready to say these peculiarities are of no moment whatever, and may be practically disregarded, and the more generally chloroform is used the less will be the danger. This may be true for a large number of cases, as it may be true that some surgeons have done twenty cases of lithotomy one after another without any casualty, but in the twenty-first case it may make all the difference between life and death—it may embrace the whole art of surgery, in other words (when a difficulty arises) to know what to do.

Sulphuric æther was recently applied by Mr Curling at the London Hospital, but, though immense quantities were used, it did not succeed; I had the advantage of assisting in the application of sulphuric æther more recently in two cases, one day this month, where the patient, a woman, at St Mary's Hospital, was kept well under its influence for about an hour! I say advantage, because with our modern experiences of chloroform and amylene one may study the process by æther, and contrast it with that by chloroform better now than formerly. Our American friends would wish us to believe that there has been no accidental death from æther, but according to cases of this kind collected by M. Trousseau, we find that of forty-nine sudden deaths thirty were from chloroform and nineteen from æther; this strikes me, however, in some very unaccountable manner, as affording a not very exact idea of the relative danger of these two agents. In a communication with Mr Hayward, of Boston, who has applied æther a thousand times without accident, he said to me he knew of no deaths by it in America. The point urged by Simpson of six per cent. of patients saved

after surgical operations by ehloroform, though opposed by the statistics of my friend Dr Arnott, has been further corroborated by Bouisson, of Montpelier, and others; and all the nervous symptoms, such as mania, conjured up a few years ago as occurring so often after operations by ehloroform, have vanished away. In Italy, as any summer tourist may discover for himself, ehloroform is almost unknown, and hundreds of most excellent surgical operations are performed at Naples, Rome, and Genoa, &c., either with æther alone or the "Vienna anæsthetic."

In testing the activity or progress of ehloroform inhalation, the absence of reflex sensation in the eyelids ought not to be taken, as recently urged amongst wounded soldiers in the Crimea, as the *earliest* and best test of the action of the anæsthetic; it is, perhaps, the *last* test on which we can rely, we have nothing beyond it; the patient is then almost entirely out of our power. In the French Military service, during the war, where ehloroform was used in tens of thousands of wounded, the rational and safe rules were promulgated—never to wait for the total abolishment of sensibility, as bullets, balls, and fragments of shell are best extracted in the *second* steps of ehloroform inhalation. This stage may be always ensured by diluting the ehloroform.

A very safe substitute for pure ehloroform in children's cases offers in what is termed "chloric æther," or a solution of ehloroform in spirits of wine. Chloric æther itself, as we might have theoretically expected, has no existence. In America (the birth-place of modern anæsthetics) a mixture of two parts of spirits of wine and one of ehloroform is used

under this name, which gives off eight to ten per cent. of pure chloroform. In Austria the State has arranged a combination of æther and chloroform, to ensure safety from sudden deaths; chloroform, according to a recent statement of M. Flourens, however, has been used 25,000 times amongst the French soldiers in the Crimea, without any bad result. All that can be said is that, taking the sensibility of the eye lids as a test of the powers of anæsthetics, both æther and amylene affect this part much less than chloroform!

The relative proportions of chloroform, as we see it every day in practice, varies for particular patients in an infinite number of ways; in other words, the doses of chloroform required in surgical operations are found to change according to the muscular or nervous development of each patient, age, sex, physical capacity of lungs, emotional excitement, &c. It does not seem a good plan to use chloroform sprinkled on a piece of lint with oiled silk, as very commonly adopted at one or two London Hospitals, as the oiled silk hinders air passing, and prevents the evaporation of the chloroform. A common cambric handkerchief in form of a cone, or the simplest kind of inhaler, without complex tubes, seems to answer very well, and as simplicity should be always studied in anæsthetics as in many other things, perhaps either of these should be recommended.

A true philosophy of consciousness and pain is very much mixed up with the safe exhibition of chloroform! Pain, it need hardly be observed, is a great leveller; the "shock" of pain brings down the strongest man to the level of the child. Nor is

there any professional greatness in surgeons visiting the sick with unnecessary pain ; even wounded soldiers, that dare the horrors of the battle-field, will wince at the knives and saws of the surgeon. To deny them chloroform, as at the beginning of the present war, seems unphilosophic as regards pain, and not very full of meaning as regards surgery ! Chloroform, as a general rule, is not at all a depressing agent. Hæmorrhage, or fear, or protracted pain, or "shock," as the result of a wound—any one or all of these will do more harm than chloroform. We see this every day exemplified in civil practice—in the horrible shattering of limbs by machinery, where the patients beg to have chloroform, and the first effect of which is to equalise the circulation and remove the depressing horrors of pain.

It requires more than moral courage to battle against pain. When Bossuet, for instance, one of the greatest men of his day, was told he had a disease requiring a surgeon, he became sick and quite unmanned, and would not listen to the words "surgical operation." D'Alembert, the intimate friend of Newton, also refused to be operated on for "stone," and no moral courage or entreaty could bring him to submit to a single incision, preferring rather to die without pain. Even Sir Humphry Davy, in our own age, entertained some very singular ideas as to the nature of consciousness and organic life, believing sensibility remained in the dead body till chemical decomposition had entirely destroyed it, and he would not, for the universe, before his death, give permission for a post-mortem examination of his own body to be made after death, fearing the pain ! What Dr Hall, in his memorable notice on chloroform

in the Crimea, and Dr Cole, more recently in India, may have intended by pain being a stimulus—and the re-opening of wounds, cutting out of balls and bullets, sawing of bones, probing of inflamed joints, and periosteum, in soldiers torn to pieces on the battle-field, as a sort of mild restorative or cordial, preferable to chloroform—it is not easy to conceive. I cannot help believing that one thing only was wanted to make our Military surgery perfect, and that was chloroform. From some correspondence with Sir Andrew Smith, I believe that is his opinion too. 25,000 times, as we have just said, it has been used in the Crimea by the French. Could Larrey have lived to read such a fact how great would be his delight!

Shakespeare, indeed, more true to the prose of every-day existence, gives us the pain and turmoil of human feelings as making up the entire sum of human life; and when he wishes to give us a world free from pain, he shuts out passion, pain, and suffering by an anæsthesia of his own (no doubt in imitation of something in the books of that age)—the witching herbs and juices of Oberon; the fairies in their dreamy half-conscious scenes, amid their enchanted charms and twilight, giving us some very singular analyses of sleep like that of chloroform—and the same merely animal emotions and consciousness—in the “fierce vexations of their dreams” that we see in invalid, or sick, or hysteric men and women—the modern Titaniads and Oberons of every-day life! The errors of consciousness after chloroform, in fact, in hospitals are sometimes not more extraordinary than those of Bottom and other

characters in this play. In other places Shakespeare describes melancholy, lunacy, and delirium, as though they were cases in a medical book, while in the herbs and juices of Oberon I cannot help believing there is some foreshadowing of chloroform, or a description of some old incantations or magic now forgotten and lost.

The study of consciousness is very interesting. Modern psychological science perhaps has solved the difficulty of this consciousness of the poets and metaphysicians. Simple feeling or its excess called pain, blotted out at will by chloroform, is the great peripheral source of consciousness. Memory, though Sir B. Brodie supposes it to have an organ to itself, is perhaps nothing more than the ground and principle of association of these ideas, one with another, set up in this active or healthy consciousness—as colours by specific relations of rays of light, music by specific relations of sound, &c. ; even reason itself, the great distinguishing mark or inalienable right of man, is by some thought to be built up also alone of this memory and consciousness scattered to the winds by chloroform. Leibnitz, and some moderns, go higher still, and give us in association with these facts of sensation and consciousness certain innate ideas in the brain or mind—ideas of “good and evil,” ideas of time and number, and so forth, denied by Locke, which make man to become as one of an entirely higher series of beings than the lower animals; ideas of harmony and beauty of no use to the lower animals, not disturbed by chloroform more than by common sleep, while in all else man, of course, shares in the same physical

and mental agents—air, and water, and electricity, heat and cold, pain and consciousness with them. This distinction between man and the Gorilla is of very great importance to medical men as regards chloroform, and, in a psychological point of view, very deserving of study.

CHAPTER III.

IMPORTANCE OF STUDYING THE DIFFERENCE BETWEEN PHYSIOLOGICAL EXPERIMENTS ON FROGS, LIZARDS, BIRDS, WITH ÆTHER, CHLOROFORM, &C., AND THE ADMINISTRATION OF SUCH ANÆSTHETICS IN HOSPITALS IN THE CASES OF SICK AND EMOTIONAL MEN AND WOMEN!—EXPERIMENTS ON ANIMALS ONLY “PART OF THE TRUTH”—AS TO PERIOD NECESSARY FOR INDUCING CHLOROFORM ANÆSTHESIA;—SHALL IT BE SHORT OR LONG?—IN FORTY DEATHS FROM CHLOROFORM THIRTY-SIX OCCURRED IN THIS, WHICH MAY BE CALLED THE “EMOTIONAL STAGE”—HOW DOES EMOTION KILL?—EMOTION OF FEAR ACTS PARTLY AS THE RESULT OF DREAD OF SURGICAL OPERATION, PARTLY OF TERROR AT LOSS OF CONSCIOUSNESS — PATIENTS OFTEN UNNECESSARILY FRIGHTENED AT CHLOROFORM—CHLOROFORM PARALYSES THE HEART, ÆTHER DOES NOT—DETAILED EFFECTS OF ÆTHER—METHYLATED ÆTHER.

We even still perhaps, notwithstanding all the advantages of local and general anæsthetics, allow too much pain in surgical operations. Our art, or the benevolent mission of the medical man, henceforth

is as much to do away with pain as to prevent hæmorrhage or fever. There is no peculiar bravery in the surgeon wishing a fellow creature pain ; there is nothing in all surgical science now to the man of delicate feeling worth one half-minute's pathological cutting open alive of a human being, or even of one of the lower animals, as told us in the fragmentary legends of Majendie's vivisections. We have no right, nor can it in any way give satisfaction to the rightly-constituted mind, to pain even a midge or a worm. These creatures cannot defend themselves. Many of them, it is true, are not endowed with as complex a sensitive system as we are ourselves, but the apprehension of pain may be the same. None of us can say how much of truth may be in the fine words of Isabella—

“The sense of death is most in apprehension,
And the poor beetle that we tread upon
In corporal sufferance finds a pang as great
As when a giant dies.”

These lines might be written with advantage over some of our operation theatres—or do we sometimes forget such a thing as pain ; or with one of the Germans, Schlegel, believe it to be a non-existent quantity in our surgical calculations, a mere metaphysical or subjective abstraction, as Schlegel says, for the purpose of giving a zest by contrast to pleasure ; that there is no such thing, in short, as pain ; the terror of falling off a cliff into the sea, the fright of a thunderstorm, the horrors and blood of a battle-field, &c., merely creating transient impressions of a sudden overpowering kind, making place for elevating emotions of pain if you will, but which he calls pleasure or the sublime ! A true philosophy of

pain, as we have remarked, is very much mixed up with the use of chloroform. Metaphysical abstractions of this kind (of Schlegel or Dr Hall) will not satisfy a man having his leg cut off without chloroform! Shakespeare says, he never knew a philosopher who could stand a tooth-ache! Mr Cole, an Army Surgeon, says, pain is a great blessing as a stimulant. He had the care of 18,000 troops in Indian battles, and says he would abolish chloroform altogether—pain being a stimulus in surgical operations, after cannon-shot, which no other stimulus can equal; it is not easy, however, to agree to any such doctrine at all. I believe most thoroughly in the mischief done by “shock” in surgical cases, and I am satisfied a very large portion of the mischief is due to pain!

It is of considerable interest to know and to be prepared for the fact, that, after inquiring at various London hospitals, as to what class of patients require most chloroform, I was told that hysteric and nervous young women—in short, those who most fear pain—are those who are brought with greatest difficulty under the soothing effects of anæsthesia. I am in the habit of placing a word or two also opposite the names of my private patients, to whom I have administered chloroform, as to whether each bears it “well,” or “badly,” “very well,” or “very badly,” and I find the last-named phrase “very badly” opposite almost all young female patients!

An interesting fact was also observed amongst *prisoners* in the Crimea, especially French prisoners, who were carried wounded to the field hospital of the eminent Russian Surgeon M. Pirogoff; it is referred to by him quite without reference to any theory,

namely, that the prisoners who were brought in terribly frightened and wounded to the hospitals of Sebastopol, and who were lying in hospital alongside the poor mujik, or Russian serf, almost invariably required double or treble the amount of chloroform that the calm stolid Russian soldier inhaled; this was purely a matter of emotion, and shows that their sense of pain or death, also like that of the beetle, was most in apprehension. The poor mujik, when wounded, was already half asleep from fatigue and exhaustion; the French soldier, on the other hand, was probably taken prisoner in a state of violent passion and excitement, not much lessened by knowing that an arm or leg was to be also cut off at once, as a primary operation, by strange surgeons. What barbarity this would be if done without chloroform, according to Mr Cole, every humane surgeon must be permitted to say for himself!

To understand the action of chloroform on man we require to study its purely physiological, as well as its metaphysical, relations to the brain. Very grave objections have been raised against chloroform for its destroying consciousness of the central organ of which we know so little; and thus trifling with human life, the entire framework or scaffolding of man's moral and sentient existence being built up on this external consciousness. It is probable that in looking for the centre of consciousness, or the soul, we have directed too much attention to the great nervous centres of the brain proper, as the sources of consciousness, life, and thought; and we have neglected the web-work of spinal and diastaltic relations of nerves all over the

frame, as the proper nervous system influenced by anæsthetic vapours. I know in this impression I differ from Dr Hughes Bennett and the Edinburgh School. Sensibility and pain are, it need hardly be observed, the great outlying roots or messengers of consciousness to the brain; if this internuncial function of the nerves be partly destroyed by chloroform in the capillaries, or ice acting on the capillaries, anæsthesia may be induced; yet the centre of consciousness may be perfect (though a *tabula rasa*, as described by Loëke, for no sensations from the five senses are referred to it, while the largest dose of chloroform may, in fact, only require proper respiration and an absence of syncope or of asphyxia, for its elimination from the system, or more correctly perhaps from the capillaries, to re-establish the relation between external or internal consciousness. Some, but not all, of the danger of chloroform inhalation arises evidently from going beyond this mere anæsthesia, and by cumulative doses abolishing nervous or voluntary motion, as of the diaphragm to wit, as well as sensation; even abolishing the reflex sensibility of the eyelids. We should always keep before us, as a purely physiological effect of chloroform, that death occurs either from asphyxia or syncope; in other words, from total absence of the natural irritability of the air passages or of the heart. The centre of consciousness all this time, like the sun-dial, though not shone upon, may be ready to receive the impressions of the outward senses; the brain, in other words, may be unaffected; but death begins in the lungs, as though the patient were drowning; or begins in the heart by syncope—so that there is really very little force in the objection

of metaphysicians and divines to chloroform, namely, that we destroy first man's consciousness ; we do not really trifle with man's consciousness more than when we prescribe a dose of morphia ; the centre of consciousness or the soul is perfect in each case, but we have blotted out the sunlight of external sensations and of the senses, and all is dark !

I believe, in point of fact, that there is a great deal that is highly important in relation to the study of chloroform as regards man and psychical emotions that cannot be arrived at in experience on the lower animals, such as dogs, rabbits, &c. Even if chloroform were used for nothing else but for rendering patients perfectly still during some delicate operations, as those in the interior of the globe of the eye, or in such plastic operations as those for mending a torn bladder in poor married females ; or such admirable operations as some resection of joints, &c. ; if chloroform did nothing else but relax the parts in other cases, such as old dislocations, or relax the inguinal canal in severe strangulated hernia, &c., still it would be an agent of vast utility ; but when we now can appreciate, in addition, its value in lessening or banishing pain from surgery, it is indeed a boon of which the Cheseldens and Astley Coopers in the far-seeing wisdom of their day never had the slightest expectation. It is a glorious thing for us, and even for our friends, the military surgeons, which the " world will not willingly let die."

In studying the effects of chloroform or æther, indeed, in this way it is obvious that anæsthesia becomes influenced in a thousand ways by mental emotion, which we can in no conceivable manner imitate in the lower animals, and influenced by the

nature of wounds and diseases, that it must ever be impossible also to produce artificially. Wesce patients constantly who fall fast asleep after an operation by chloroform ; the emotional dread of the operation, with the pain of previous illness, is at an end. All the history and poetry of the emotions thus becomes useful. Ariel thus contrasts curiously with Caliban the soul or finer emotions of man's nature with his mere animal or brute instincts, Caliban signifying, according to the commentators (*χαμαι βαν*), one grovelling all fours upon the ground, as a pig eating pig-nuts ; not far removed, perhaps, from our poor Russian serf or mujik. Both the mujik and the French prisoner are, no doubt, affected by chloroform, but both differently. As regards emotions, we must now never forget that contractility of muscles may be called into action by *psychical* stimuli or mental acts quite as much as by physical agents. It may be the same with the heart and other parts.

In connexion with chloroform it is well to keep in recollection that the nervous centre from which the muscles derive their impulse to contract is the same whether the movement be prompted by an impression which does not form an idea in the mind or an impression giving a sensation, an emotion, or a volition.

A little while ago I suggested the danger of administering chloroform to epileptic or hysteric patients. The experiments of M. Brown-Séquard fully bear out that impression, as it is only by rendering one side of the face of the animals experimented on insensible and irritating that insensible side that he can induce the fit of epilepsy ! Who shall yet speak of the precise parts of the brain

anterior or posterior to the corpus callosum, that emotional half-way house where chloroform lingers latest? Reference was made to a very profound remark by M. Brown-Séquard, that we do not yet know at what part of the brain external physical impressions arrive before they furnish *ideas* to the mind, some parts receiving external physical impressions very probably, and sending only reflex impressions again, of which a perfect idea is not necessary, the retina receiving one kind of physical picture at which the mind looks as at a photograph, hyperæsthesia, too, curiously alternating with anæsthesia in these epileptic cases! Nay, whatever causes paralysis of sensation (recognised by decussation at the opposite side) causes this very hyperæsthesia by more blood in the vessels of the limb from paralysis of its vessels! The amount of *vis nervosa* in the body is always a constant quantity; but one of the greatest drains of nervous force is afforded by the emotions of the mind. A man will scarcely die from an amount of exercise more to him than a steeple-chase is to a horse, yet such men have dropped dead from the simple nervous exhaustion of a fright, such as looking at a ghost on the stage, or men have died of the alarm from a thunder-storm! On what part of the brain do emotions act? Are they, as some one says, reflex actions of the soul itself on the body? According to Locke, ideas in the brain either are modifications of thinking in that part or perceptions *ab extra*, objectively looked at or studied by the consciousness, we sometimes may thus objectively look at one part of the brain, as it were, receiving certain half-formed impressions from another part.

In America, I am told, patients are brought under the effect of æther in two minutes, and in Austria and Italy even in a shorter period, so that it is not considered remarkable that chloroform anæsthesia may be induced in the same period.

As to the amount of time necessary for bringing a patient under the effects of chloroform, I think seven minutes, as observed by the assistant at St George's Hospital, or ten minutes at Guy's, is too long. The plunging is excessive. At the same time it is difficult to lay down rules. I had two cases this month myself, on the same day, with dentists near Hanover square. One was a lady who had eight teeth out; she bore it admirably, and went as quietly as possible through the process; she was completely anæsthetised in three minutes. In the case of another lady, however, on the same day, who had only one tooth out, I gave her what was thought a more prolonged or mild dose of chloroform; but the mildness, as Professor Simpson suggests, caused violent plunging and restlessness, and I had to increase it. A death at St George's Hospital, from fainting and excess of emotion, exhibited the danger of emotional depression. Dr Snow, however, who had been for years in attendance at that hospital, applying chloroform, did not seem to think it a death fairly ascribed to chloroform. We hear of deaths, for instance, from such a simple operation as perineal section, but where no chloroform had been given, so that there is nothing more faulty than generalising from a dozen or two of cases at one single hospital; but as I propose to devote an entire paper to this grave and terrible subject of death from chloroform, I will only at present say

that I think a good rule to follow — and one acted on this month in a case by an excellent and cautious surgeon, Mr Lane, of St Mary's—is, in all exceptional cases, to substitute æther for chloroform. In this case the man had had chloroform previously for another operation, and was on the point of death from syncope. Mr Lane was now called on to perform amputation of the thigh for the same disease; so his substitution of æther in place of chloroform, though we watched the pulse with great anxiety, was quite successful.

I am, I hope, not unduly anxious to dwell on this subject of emotional irritability and depression on the part of surgical patients in the preliminary steps of chloroform administration, as it is of necessity very much lost sight of in the large London hospitals. In private practice I have often found, on the other hand, it required a good deal of moral courage, especially in midwifery cases, to decide whether we shall at once induce complete anaesthesia, the emotional anxiety and hysterical agitation is so great; there is very little or no danger in these cases in doing so.

In expressing a belief that chloroform does not act so profoundly, or in such a specific manner on the brain proper, or that part of the cerebral mass above the *septum lucidum*, as it acts very obviously on the simple grey matter of the cord and medulla oblongata, I feel we are borne out alike by what we see in hospitals, and what is revealed to us in the irritant action of chloroform on the large spinal system of snakes, lizards, birds, &c. I know I differ a little from the last writer of the Edinburgh School, Dr Hughes Bennett, on

this point; but he has probably formed his impression rather from the popular idea of chloroform—viz., the danger of deep insensibility or coma. It is curious that we have very little to fear from this stage of deep chloroform intoxication, or coma; like as a ship in deep sea, with plenty of sea-room, chiefly dreads coming into or going out of the shallow water of a harbour, so we must never forget that of forty well-marked cases of death hitherto from chloroform, thirty-six took place, not in a state of deep coma, but in this preliminary stage of epileptiform convulsion or “exaltation of sensibility!” In fact, in one half of these forty cases, the inhalation of chloroform was stopped—by death—before the surgeon had commenced his operation at all; the third stage of prostration or anæsthesia had not commenced. This explains to me also the danger of chloroform in the second stage in strong adult men and hysterical women rather than in children, where this stage is absent.

I cannot help, in fact, believing that emotional depression so curiously and inextricably interwoven with the functions of the spinal and sympathetic system had much to do with these mysterious deaths, joined perhaps to certain sudden accidents, such as bursting of vessels, &c., from the violent, convulsive, half-epileptic fits so peculiar to this first and second stage of chloroform anæsthesia; in order to prevent this, indeed, in Paris I have observed that a great deal of trouble is taken by many *petits soins* to calm the emotions and assure patients of perfect safety before they begin to take chloroform. The plan is a very good one.

I have tried very imperfectly, but not without a

purpose, to give some idea of a true philosophy of pain and emotion, contrasting from the writings of the greatest of all English writers. The dull emotionless Caliban, one "not honoured with a human shape"—Ariel, who is all touch, all feeling, all passion—and Prospero, whose highest praise seemed that—

"His pulse
Beat as of flesh and blood,"

who rules with the power of an enchanter on his desolate island, but who, at the sight of human faces,—even of his enemies—though otherwise he is indomitable—is overcome at once by his emotions—

"Mine eyes, ever sociable to the show of thine,
Fall fellowly drops."

These are all symbols of what we see, in fact, in chloroform experiments on the lower animals and man—what we see in clinical practice of hospitals, and in hysteric cases in private practice ! It may be asked "How does emotion kill ? Why speak so much about what is so well known." We hear occasionally of persons dying suddenly from joy, others from fright of a thunder-storm, from the "shock" or fright of a scald or burn, &c. &c. M. Brown-Séquard tells us that in such cases the emotion expends itself on the ganglionic system, and the heart is literally paralysed or stopped. Here, again, by understanding this point in chloroform practice we may often prevent danger. Thus, I have frequently seen patients in Paris "cheated out of their fears," so to call it, as they were told (after their permission was obtained to use the knife) that a certain amputation or operation would be done on a certain

Thursday or Tuesday, but done the day before, or done on the instant !

The amount, even, of healthy, ordinary sleep each day is probably in proportion to the amount of healthy "wear and tear" of the system, and the absence, I think, of emotional excitement ; for something in the shape of good news, as well as of bad news, will keep the mind uneasy and awake. Thus, a traveller that is to be up early in the morning to catch an early train will wake to the moment ; in fact, he has been scarcely asleep at all—emotion, of some sort or another, has destroyed complete sleep. The condition of the emotions and the state of the pulse of wretched criminals before execution is also well known. Starvation is another cause of want of sleep, as there has been no exercise or wear or tear of muscle. We have all these conditions in hospital patients under chloroform !

Of the new world, revealed by Sleep, poets of all ages have written, of course, a great deal, but we are more interested with the fact that this emotion, or nervous irritability, especially in female patients, which destroys natural sleep, also involves an increase of chloroform to produce anæsthesia. Wordsworth remarks that twilight has the power of removing, softening, harmonising, or rendering abstract certain things otherwise lost in the bustle and blaze of the mid-day sunshine : so it strikes me is sleep ; it removes some objects, and makes others more clear—it leaves out a great deal of what is known to us as association of every-day ideas, and introduces us to a world of "innate ideas" and new but useless fancies, and new illusions. Chloroform patients

thus sing songs, under chloroform, they never knew before, &c.

The effect of the emotions or passions in breaking up a dream of this sort is also curious, more especially the complex passions of anger or envy. I need not go into the subject of the seat of emotion in the middle lobes of the cerebrum—a doctrine that has many striking facts in its favour—nor refer to the local seat of consciousness or of the sensorium mentioned previously. The effect of the emotions or passions on the heart or pulse or brain is as old as the love sickness of Stratonice, and as ever-recurring as the fancies of half-a-dozen years ago, when it was believed, especially in midwifery practice, that chloroform had induced many kinds of death and mania, or, as evident and ever-recurring as these, thirty-six deaths out of forty in the emotional stage of chloroform! In fact, there is more than mere poetry in many of these analyses of emotion; the passion of anger breaks up a common dream by the effort of muscular resistance or revenge it calls forth; this wakes up the entire spinal system and sensorium. In the administration of chloroform we have the converse of all this—we have the spinal system and sensorium and the passion of fear to control; I have just said how this is effected occasionally in Paris. I do not feel myself that I overrate the very great seriousness of deaths from chloroform, or the influence of this emotional stage of anæsthesia. A gentleman at one of the ophthalmic hospitals in London, who administers chloroform, and who has seen a good deal of the hospitals also of Berlin and Vienna, tells me he has witnessed personally eighteen to twenty deaths

directly from chloroform, only one at his own hospital, but three at Guy's. Cases of cancer or atheromatous arteries, he believes, are particularly liable to accident, probably from bursting of vessels, in this preliminary stage of convulsive action. The larger number of chloroform deaths are never reported.

Man differs from, and breaks off, so to speak, from the entire animal creation, at this point of emotional excitement or depression ; of a love for æsthetic harmony in creation, self-responsibility, and a dread of death ; and it is here that poets lend us such great assistance—especially Shakespeare*. I have

* The reason of having so many references to Shakespeare is that his characters are familiar to all readers. An able and forcible writer, "B.W.W.," differs from me in my estimate of Shakespeare, and looks upon the strikingly beautiful analyses of mania, sleep, and anæsthesia, in the writings of the Bard of Avon, as a sort of accident ; he says, we have not any evidence that stupefying or anæsthetic medicines were known in the marvellous age of the Drakes and Raleighs, of James and Elizabeth, &c. &c. Now, Shakespeare began to write in 1586, and I have already shown that in the poetry of Middleton and the writings of Du Bartas, Canappes and Theodoric, in 1538, anæsthesia is distinctly referred to ; thus Middleton says :

"I'll imitate the pities of old surgeons
To this lost limb, who, ere they show their art,
Cast one asleep, then cut the diseased part."

In Camerarius, who was writing when Shakespeare was alive, we have the original story of Puck and Oberon's juices. Of one of the drugs also of this time, a quintessence distilled from the strongest wine

known patients, over and over again, refuse to have chloroform, and when asked why, they replied they feared death so much from it, they could not conquer their repugnance to anæ-

five times over, and afterwards distilled with sulphur and salt and lime, we read, "the aforesaid drugs being converted into an essence, this is to be shut up in leaden vessels, lest the subtle aura should escape," and when used, we are told, "the vessel must be brought immediately under the nostrils, and the patient will draw in by breathing, and thereby his senses will be locked up, as it were, in a citadel." I do not want to draw from this that Oberon knew what chloroform is, no more than that Galen knew Dr Chambers because both have hit on the same idea of pepsine.

Shakespeare knew, however, very well the writings of Paracelsus and other

"learned and authentic fellows,"

as he calls Paracelsus and the alchemists. The whole story of 'Macbeth' is, word for word, out of one of the books of these writers; the story of Autolycus is out of another; wherein were written the "vertues of herbs, plants, stones, and minerals, which deceive our senses and produce miraculous alterations in the air," causing plagues, thunders, &c. The most remarkable thing in Shakespeare, I think, as regards anæsthetics is Christopher Sly; yet this is out of another of the books (Holberg). A tinker, as we would say "hocussed" or rendered intoxicated, is removed out of a puddle in the street and lodged in a palace, and deceived, as a sort of joke, into the belief that he is a nobleman; but mark the beautiful analysis of consciousness—by

thesia and entire loss of consciousness. Of course, we cannot study these effects of chloroform and purely human emotion in the lower animals; in the operating theatres, however, of our large hospitals an

Shakespeare, as the tinker awakens—"Do I dream?" he asks,

"Or have I dreamed till now?"

I do not dream;—I see, I hear, I speak;

I smell sweet savours and I feel soft things."

It is curious there is no sense of taste here; but Shakespeare was inscrutably and wonderfully right. Modern science shows there is no "gustatory nerve."

Ben Jonson's play of the "Alchemist" is the "Fownes's Manual" of the chemistry of Paracelsus, and of that queer but delightful age; and Shakespeare not only read but corrected and partly edited this play. I believe, in fact, Marlowe, Ben Jonson, and decidedly Fletcher, are the writers of several things in Shakespeare; the Americans say Lord Bacon, but that is not so likely. Lord Bacon's philosophy—which is, I think, much misunderstood of late years—ran, however, much in the direction of the quackeries of Paracelsus, and for all practical purposes is almost as useless as the modern writings of Swedenborg.

There was, in Bacon's time, an entire set of medicines as well known as diaphoretics or anæsthetics amongst us—called "odoraments and suffumigations," consisting of little bags of mandrake (which was a species of belladonna) mixed with opium and rose leaves to be smelled to. "Odoraments" of vinegar and opium are very common, and it is even grimly discussed whether such odoraments may not act as tonics. "In fevers, too,"

extensive field is offered for observing such phenomena. There is an eminently interesting part of the subject, in fact, to watch these emotions and the different functions of the brain in patients, as well

says Baeon, "cold odoraments serve to refrigerate the brain and the spirits;" in another place it is said, "*Absynthium somnos allicit Olfactu.*" Wormwood induces sleep by inhalation of its vapour. Did time permit we could fill pages with the alleged virtues of these "odoraments." Baeon and Shakespeare were quite familiar with them. By the aid of this sort of light, we understand why Caliban advises the sailors to destroy the books of alchemy of Prospero, and how the power of Ariel, which is sometimes called an "eestasy," is not so very far from the insensibility and influences exerted by odoraments. Oberon and Puek, I have already said, as well as the witches in 'Macbeth,' are directly copied from the books of alchemy. Chloroform is not there, but the germ of anæsthetics most decidedly is.

"B. W. W." says Shakespeare was "too great a philosopher and too bold a reasoner" to believe in such things as the adder's fork, the poisoned entrails, the toad with sweltered venom—

"Seale of dragon, tooth of wolf,
Witch's mummy; maw and gulf
Of the ravin'd salt sea shark,
Root of hemlock digged i' the dark."

But is "B. W. W." so very sure of that? Now, it is a curious thing "Curara" poison at the present instant is thus made by a peculiar caste of witches in India, as well pointed out by Claude Bernard; but, as Shakespeare borrowed the whole play of 'Macbeth' from the quacks, as they were called, we

as the regularity with which the different senses or external association of ideas change into singing songs and false illusions, as already hinted at; each, as if by the wand of the enchanter, becoming entangled in the Oberon charm or snare of chloroform; and when the emotions are at rest, we have a new and wonderful world of sleep—thus described by Keats, with great truth:

“Oh magic sleep!

That brood'st o'er the troubled sea of the mind
Till it be hushed and smooth.

Great key

To golden palaces, strange minstrelsy,
Echoing grottoes full of tumbling waves
And moonlight—aye to all the magic world
Of silvery enchantment!”

are relieved from thinking it one of his reveries or a “*hiccius-docius*” at all. “B. W. W.” is not exactly right when he says the charm of Oberon was an *anti-soporific*, intended to act while Demetrius and the lovers were asleep so as to pervert their love when awake; for Demetrius suddenly says, as he falls asleep in spite of himself—

“Faintness constraineth me

To measure out my length on this cold bed.”
And the inimitable wit of Shakespeare reaches its climax when poor Bottom, with his ass's head, so marvellously hairy about the face, amidst shouts of laughing, pleads that he, too, is a victim to the odoraments and suffumigation and charms, for he says unexpectedly—“I have an exposition of sleep come upon me.”

CHAPTER IV.

ON ÆTHER—SPECIFIC RELATIONS OF ÆTHER TO THE SENSE OF “TOUCH” AND TO COMMON SENSATION, MORE MARKED THAN THE SIMILAR RELATIONS OF CHLOROFORM—ON ALDEHYDE AND ITS EXISTENCE IN THE INTOXICATING PRINCIPLE OF SOME WINES—NITRIC ÆTHER A POWERFUL ANÆSTHETIC—SULPHURET OF CARBON AND OXIDE OF CARBON—COMMON ÆTHER AND THE CHANGES IT UNDERGOES WHICH DESTROY ITS ANÆSTHETIC PROPERTIES—THE REASON WHY ÆTHER IS LESS DANGEROUS THAN CHLOROFORM—CONVULSION ALWAYS TO BE DREADED DURING ANÆSTHESIA, BY ÆTHER, OR CHLOROFORM—GRAVE NECESSITY OF ALWAYS USING PERFECTLY PURE ÆTHER—MODE OF APPLYING ÆTHER IN ITALY AND AUSTRIA—METHYLATED ÆTHER.

I propose now to speak of inhalation of æther, and the specific action of various agents, or the particular relations of some active medicinal bodies to particular organs. By direct experiment on the lower animals we have now arrived at some good results: thus, veratrine, strychnine, and opium act alone on the grey matter of the cord and brain; concine and woorara, on the other hand, on the nerve tubes;

prussic acid and cyanurets on muscles ; but nicotine and æther, and probably chloroform, on both the grey matter and the nerve tubes in unequal proportions. The action of chloroform, however, with which we as practical men in hospitals have most to do, is its action on the heart. Now, chloroform in hundreds of experiments on the lower animals is found invariably to paralyse the heart, but sulphuric æther cannot be brought to do so ; if a quarter of a drop of chloroform be placed with a pin on the heart of a frog it stops its action at once ; in the case of æther the action is more diffusible and less formidable.

Some of the æther of the shops is very impure ; so that, for purposes of anæsthesia, it will be necessary to use what has been purified. The effect of sulphuric æther is sometimes very curious in hospital patients, and differs very little from the phenomena of wine intoxication. I generally use a large conical sponge, which must be well squeezed out of warm water first, and the æther then poured on it, a couple of drachms at a time, or even more : the patient describes first a sense of fulness and warmth, the vapours of the æther feel to the patient to diffuse themselves through the brain, and to penetrate the body ; there is a lightness and sense of elasticity as of a new world ; the sense of hearing is confused ; sight dim ; the muscles are remarkably relaxed ; and the patient seems to be floating or sinking. The vapour of æther is not so unpleasantly pungent as chloroform, but requires to be supplied in enormous quantities.

The curious incongruity of feeling occasionally found under chloroform inhalation is experienced also in a very marked manner under æther ; the bistoury or

amputation knife is perceived under æther as a blunt instrument streaking out lines upon the skin. I have observed this dozens of times, by asking patients what they felt. The saw is heard sawing the bone, but no pain accompanies it. All this has a practical bearing for the surgeon.

A poor lady, who had half-a-dozen or ten teeth extracted under sulphuric æther, explained the matter to the dentist as a curious dream; she said she felt as if floating in a voyage at sea, and getting into the surf; on a rock she was attacked by a SHARK; down, down, down went the shark, holding her in his teeth, but not paining her in the least; nor was she liberated from the jaws of the monster, she said, till her friend the chloroform or æther doctor, who was present at the bottom, and who by some magic had come "unto those yellow sands," with all that had not faded or

"suffered a sea change,"

of the dentist, too, had pulled all the teeth of the shark, to her great delight! She could feel and hear the crunching of the forceps on the teeth of the shark — the jaws of the shark melting, in fact, by a sort of dissolving view, into her own jaws, just liberated from her four molars and incisors innumerable! The alleged medical facts of *clairvoyance* are obviously not far off from this actual fact of this poor lady and the shark.

One explanation of these phenomena is to be found in the fact, that the sense of "touch," and the sense or perception of pain or common sensibility, are two different things; this is what I previously alluded to, as a true philosophy of pain. It seems now decided that the posterior columns of the spinal

cord conduct impressions of "touch," and the grey substance of the centre of the cord that of sensibility or pain, as from burning or cutting, &c. In this lady, the grey matter was entirely anæsthetised, but the sense of touch remained unchanged; probably coneine, as just mentioned, would have prevented this. The dentist holding her jaw conveyed an idea of "touch" to the sensorium. A patient that I saw operated on not very long ago, by Mr Erichsen, had a similar idea of touch, or of a blunt instrument streaking out lines on his shoulder; but no fancy that it was a red-hot cauterising iron!* I referred before to the great safety of the "Vienna anæsthetic" (that of 1 of chloroform to 6 of æther in cold weather, or 1 to 8 in warm water), as well as the usefulness of a dose of opium in some cases. Here, probably, we have common sensibility and the perception of touch both diminished or abolished, the action of the heart sustained, and the patient saved these dreams, which are not always so agreeable as those just recited. These matters of "touch," common sensation, and reflex action, may appear mere trifles in their relation to chloroform, but they are full of deep meaning when we come to treat cases of paralysis and the myriad forms of maniacal or nervous diseases, or to decide, as I am often asked to do by letters from the country, whether such or such a nervous patient in the country may have

* M. Schiff differs with M. Brown-Séquard as to the exact mechanism of these phenomena in the cord, but about the fact itself all are agreed. In a conversation with M. Brown-Séquard recently he did not make it plain to me that he was right; the view that I have given is that of M. Schiff.

chloroform for some impending surgical operation. I had a letter this week, for instance, from Wigan, and one a little while ago from Pau, in the Pyrennees, to decide such points.

I would only further say, in recommendation of æther, that it may be procured somewhat easier and more cheaply in all parts of the world than chloroform. I see no objection to the use of methylated spirit in the manufacture of æther ; and, in fact, I have used it or ordered it in my dispensary practice, in the city, from a feeling of making chloroform and æther, as anæsthetics, as cheap as possible, and accessible alike to the poor as well as to the rich. Many operations in hospital or dispensary practice, such as that of reducing an old dislocation of shoulder or hip (admirably performed under æther), will require a pint of æther ; this in America costs a shilling, but in London, Dublin, or Edinburgh perhaps four times this amount ; if methylated spirit be used, however, æther in London might be got for what it is in Boston !

We have spoken already of the comparative value of æther and chloroform as anæsthetics, and the general adoption of æther in surgical practice in Italy, Austria, and America, in preference to chloroform, as well as the relative danger of these anæsthetics. It may be well to refer now to a few other anæsthetics which have been recently experimented with, producing effects more or less encouraging, though not generally known to medical practitioners. This may be useful, as much to indicate what importance is still attached to this branch of practice, as to exhibit to the reader that, in the present aspect of chemical science, the cautious surgeon or phy-

sician is very much restricted in his choice to further trials with æther *or* chloroform, or (as I am trying at present) to æther *and* chloroform mixed in the shape of the "Vienna anæsthetic." I do not at present think it necessary to mention some further trials with amylene at Berlin, as in the paramount subject of deaths by anæsthetics it has been "tried and found wanting."*

"Aldehyde," which obviously comes first in order, was suggested very early by Poggiale, and was extensively experimented with, in the form of inhalation, as an anæsthetic. It is, as most readers are aware, a limpid ethereal liquor without colour, mixing freely in all proportions with water, alcohol, and its higher representative, æther; it has an unfortunate tendency, however, to undergo some harlequin transformations into various crystalline compounds like camphor, apparently isomeric with aldehyde; very curious for the chemist to tabulate, but not at all satisfactory or important to the physician who studies anæsthetics. Where aldehyde

* Some very elaborate and minute examinations have been recently made of the amylene of the shops, and it is found to contain variable but large proportions of free chlorine, and probably in shape of chloroform. It is doubtful, in the process directed by Balard (where chloride of zinc is used as recommended), whether any pure amylene is in reality produced: so that all the recent experiments with amylene on animals have been with what I originally stated, amyl-alcohol rather than amylene! It seems also conceded that the quasi amylene has proved less dangerous than chloroform, as I also stated more than once!

has been used in the human subject in place of chloroform, as an anæsthetic, it produced an embarrassing sense of dyspnœa, attended with violent cough, together with a peculiar feeling of constriction of the throat. I mentioned before that some well-known weak Rhine wines, remarkable for their *bouquet* and absence of spirit, produce intoxicating effects and anæsthesia more readily than other wines, like sherry, with an equivalent of brandy in them. These weak Rhine wines, according to the ingenious researches of Mûlder, contain aldehyde and some other delicate metamorphoses of amylene or fusel oil. The late Dr Snow told me a year or two ago of some impressions of his regarding aldehyde, which led him to try amylene; he found also that aldehyde produced, in fact, marked anæsthesia.

“Nitric æther” is another compound like aldehyde, which has been experimented with. This fluid is like common so-called sulphuric æther, but is at once known by its sugary taste. I am very much inclined to try this æther; it produces what I have already described as absence of sensation through the grey matter of the cord, as in this typical case of the lady and the dentist, and common æthers—but it leaves the sense of “touch” [shall we call it the reflex or diastaltic sense of appreciating tactile phenomena?] unchanged.

Nitric æther (of course not the *spts. nit. dulc.* of the shops)—pure nitric æther produces insensibility to pain, in fact very readily; but as I think it leaves the sense of appreciating tactile phenomena unchanged, as the patient, though anæsthetised by this æther, is sensible of the rush of blood

through the arteries of the head in a very painful manner; nitric æther by inhalation is also followed by headache. The "nitrous æther" of the shops contains, along with some other elements with which we are not now interested, a large proportion of aldehyde; pure nitrous æther is a different preparation altogether; but it is very easily prepared, and has an agreeable odour of apples. As the vapour of nitric æther is liable to explode, that of this æther is deserving of further trials on some of the lower animals.

"Sulphuret of carbon," and "Oxide of carbon" have also been tried as anæsthetics. The former is a transparent colourless liquid, of somewhat repulsive odour, but a very powerful anæsthetic; the latter, as experimented with by M. Tourdes, of Strasburgh (in several surgical cases), is somewhat too dangerous, as often painfully evinced by persons suffocated by coke fires; it is even more poisonous than carbonic acid gas. In fact, it is now stated that carbouic acid may be inhaled into the lungs if used cautiously, and that in irritative cough it acts as a sedative or anæsthetic, like æther!*

* I remember a very instructive case of asphyxia from carbonic oxide, some would say, others carbonic acid—perhaps both carbonic acid and carbonic oxide. A poor vestry clerk, his wife, and niece, living in apartments adjoining a church, in some evil moment had the iron chimney of the church stove "let into" the flue a little above their fire-place. One Monday morning it was found that the poor people did not answer the milkman's bell. I was asked what I thought of it; a ladder was got,

Common Sulphuric Æther, or as it is more correctly termed, æther, stands at the head of the list of anæsthetics in historic interest. There is a true sulphuric æther, but as it is so quickly decomposed, it is as useless to us as our old friends Puck or Ariel, or Lord Bacon's odoraments and suffumigations! Æther is so well known that it requires no description. As Locke says of a definition of

and a man mounted to the window, and said he saw three people inside lying dead. The door of the church was at once broken in, and I shall never forget the sight: the poor vestry clerk was stone dead, lying with his face over his Bible, which he had been reading for the family; his wife was lying against the table, stone dead also. But the most curious feature in the case was the state of the niece; she sat near the door, and, falling anæsthetic on the ground from the gas, her face and mouth came near the bottom of the door, where some slight amount of air found entrance. She was to all intents and purposes dead, without pulse, but quite warm. I had her at once removed into the open air; she slowly revived, began to breathe, but then fell dead! Bichât has shown that black blood in the arteries after apoplexy does not necessarily stop the action of the heart. She had been probably twelve hours previously breathing carbonic oxide and carbonic acid, mixed with such minute portions of atmospheric air from under the door as kept up that sort of circulation, which Mr Paget has spoken of, where we have clot in the large pulmonary vessels; the right side of the heart, too, as in Nysten's experiments, continued still at work, but the left side extinguished for ever!

“time,” *si non rogas intelligo*—if you do not ask me to describe it, I know it; so of æther. Its boiling point is 38° C., its specific gravity, 0.71; consequently it may be made to boil in the palm of the hand. In hot countries like India, or in the close wards of an hospital, if preserved in imperfectly-stoppered bottles, æther absorbs oxygen, and has a tendency to go into acetic acid; this impure æther then mixes with water in all proportions, which well-preserved æther, of course, ought not to do. A good instance of how we may be mistaken, after all, in what we deem to be good æther has been quite unexpectedly brought to my notice by Mr Curling’s house-surgeon, Mr Rutledge, and as occurring where the chemical ability of Dr Letheby was available, I give the letter in the words of Mr Rutledge.†

† Mr Rutledge’s letter is as follows :—

“Dartford, Kent, July 23, 1858.

“Dear Sir, — You state that ‘sulphuric æther was recently applied by Mr Curling, at the London Hospital, but, though immense quantities were used, it did not succeed.’

“I presume you have not been very correctly informed as to the administration of the æther in the case to which you allude. The patient, suffering from tetanus, was under the care of Mr Curling, and, as one of the House-Surgeons of the hospital at that time, I was entrusted with the use of the æther; I failed, for two reasons—first, the æther was impure, and secondly, I had an imperfect apparatus. In a subsequent case, the late Dr Snow attempted with his own apparatus to place a patient under the influence of the same æther, but failed. The æther

Why is æther admitted on all hands to be safer than chloroform? It seems generally conceded by good observers that the stage of preliminary excitement during the administration of æther is much shorter than the parallel stage or condition of excitement under the effects of chloroform, and very much shorter than that of amylene. Now I have already shown, by the result of all the best reported cases of death from chloroform, that in forty deaths not less than thirty-six occurred during this stage. This partly explains why æther is not so dangerous, while common experience in hospitals or dental practice helps to corroborate the fact. I perceive that M. Denonvilliers, of Paris, a very cautious observer—who believes, however, that all the deaths from chloroform have been from overdosing—looks also upon the early stage of the chloroform process, or that of emotional excitement, as the most dangerous. It seems, indeed, now pretty well established by good observers that in man, at least, nervous and epileptic complications, or emotional paralysis, are to be feared rather than fatty heart.

was then examined, and found to be miscible with water; I then ascertained that it had been some time in stock, and I suppose had undergone some decomposition. Since that time I have had no difficulty in placing a patient under the influence of good æther.

“I trust you will kindly take some public notice of this explanation in your admirable Papers, and thus relieve Mr Curling, whom I esteem as an eminent surgeon, from an imputation which might involve his want of professional credit or skill.”

Desault mentions that a sort of endemic of diseases of the heart occurred in Paris after each French revolution, caused by the emotional excitement of the period! so that we may have functional disarrangement of the heart brought into active existence, as a secondary result of this emotional agitation. In the lower animals, however, it must be said that we often see the animal, to all intents and purposes, as regards the respiratory movements, lying dead, but the heart still beating. I would advise young experimenters, in fact, to take care of this in experiments on cats and dogs, as such creatures start up and may bite when least expected to do so.

It is rather curious that all the symmetrical portions of the body, as a rule, such as the pons varolii cord, brain, extremities, &c., are those first affected by both æther and chloroform, while the unsymmetrical, as the heart, stomach, &c., are affected, as it were, in a secondary or inferior manner. Now convulsions, as well pointed out by Bichât, usually precede death or serious injury of the former, and are always to be dreaded during the process of anaesthesia. In a case of death at St Thomas's Hospital, the man fell forward on the ground in a convulsion; in the case recently in Paris the soldier was convulsed, &c. I do not wish to say, of course, that deaths without convulsions have not also occurred.

As well as I remember in two deaths from æther in this country, the particulars of which were related to me by the late Dr Snow, in one his impression seemed to be that the fatal result was rather due to excessive hæmorrhage, which set in during the progress of the surgical operation; in the other case, he

thought asphyxia was induced by too much of the vapour of the æther. I have been told by Mr Hayward, of Boston, however, that in Italy and Austria, whence he has recently returned to England, æther is applied in vast quantities in a sort of mask, and the entire face is covered with lint, or a handkerchief saturated with æther! It is calculated that a patient can be brought under the influence of chloroform with only one half the capacity of both lungs exposed to the vapour, but that the capacity of the entire lungs and minute bronchial tubes is almost too small or limited for the vapour of æther.* From the action of æther in asthma, where it acts most beneficially, it is even obvious that the larger bronchial tubes are, under the vapour of æther, relaxed and receive more of this vapour than of common atmospheric air.

This effect of æther, indeed, of relaxing muscular tissues, makes it signally valuable in reducing old dislocations where we have to overcome muscular tension; in strangulated inguinal hernia also it is very deserving of trial in preference to chloroform. It is curious now to look through old dusty books, and find patients with tetanus given up as incurable,

* A curious fact, pointing to the local action of chloroform on *both* lungs, has lately been discovered, viz., that if an animal breathes chloroform vapour in only one lung and common atmospheric air in the other lung, he does not become anæsthetic! Mr Erichsen is in the habit of saying "Take care of chloroform in patients where one side of the chest is permanently dull, or where there is chronic cough." Both observations are suggestive.

but their "passage to the grave" lightened by giving them a little æther to inhale, which unexpectedly cured them. It will be seen in the letter of Mr Rutledge that his account and mine differ in no particular whatever; but it shows us how careful we should be to use none but the very best æther and chloroform for purposes of inhalation. Mr Curling is one of the ablest surgeons in England, remarkable for the accuracy of his practice and the anxiety he evinces to give the patient the benefit of every new and real improvement as it arises. It is a pity then to find the result or object in the treatment balked by one of the whimsies, so to call it, of chemical science.

We should distinguish such accidental changes in æther from mixtures with æther. I have already said that I see no objection to methylated æther, as it differs little from ordinary æther; its specific gravity is greater, and an occasional "idea" or far off fancy of onions in the smell is not the slightest harm.

CHAPTER V.

ON CHLOROFORM AND ITS EARLY HISTORY—CHLOROFORM MENTIONED IN WOOD AND BACHE'S DISPENSATORY IN 1838 AS AN ANÆSTHETIC—GUILLOT — SIMPSON — HOW CHLOROFORM IS PREPARED—BEST TESTS OF THE PURITY OF CHLOROFORM—MODE OF ADMINISTRATION—INHALERS—WHETHER IT IS BETTER TO USE AN INHALER FOR CHLOROFORM—PRECAUTIONS TO BE OBSERVED AS REGARDS THE PATIENT—THE SYSTEM TO BE IN A STATE OF QUIETUDE—PRECAUTIONS TO BE OBSERVED AGAINST NAUSEA AND VOMITING—THEORY OF VOMITING DURING CHLOROFORM ANÆSTHESIA ACCORDING TO THE AUTHOR—VOMITING TO BE EXPECTED TOWARDS THE END OF THE OPERATION—CHLOROFORM AND ÆTHER, PROBABLE ANTAGONISTIC AGENTS TO—SUGGESTIONS AS TO THE MANAGEMENT OF PATIENTS PREVIOUS TO THE INHALING OF CHLOROFORM OR ÆTHER.

It remains for us now to make a few specific observations on chloroform, having spoken already at no little length of æther and some other anæsthetics. No doubt we are still in much obscurity and darkness as to the causes of death and other ill effects of chloroform ; we are like the dwellers in the dark city

underground, spoken of by Plato, who were puzzled by occasional glimpses of sunlight, and could not construe their meaning; so of the steady but occasionally uncertain glances at the truth that we have been arriving at in "anæsthetics," and as to the source of the hundred deaths from chloroform. It is very easy to refer back amongst old books in college libraries and discover, as I have done, rather by accident, that exactly twenty years ago chloroform is mentioned in Wood and Bache's old-fashioned "American Dispensatory" in the following words:—"In affections characterised by difficult respiration, chloroform may be used by inhalation;" this being evidently the first mention of chloroform—the first sign of the great coming event of the second half of the nineteenth century, as it appeared "casting its shadow before." A M. Guillot, also, on the Continent, it seems used it even previously to this shadowy era for "asthma and headache;" still, notwithstanding these and several other facts, I am very much inclined to give nearly all the credit of the invention of chloroform, and the light it has shed on the modern practice of surgery since 1848, to Professor Simpson and to my late much-regretted friend Dr Snow.

It is very probably by happy guesses and half-discoveries of this kind, rather than by slow "induction," so called, from facts, by fortunate use of "analogies," that all the modern triumphs of organic chemistry have been achieved, and chloroform, like the electric telegraph in the Atlantic, has become the great fact of the age!

The usual method adopted for the formation of chloroform is the following:—One part of hydrate

of lime is suspended in twenty-four parts of cold water, and chlorine gas passed through the mixture until nearly the whole of the lime is taken up or dissolved ; a little more of the lime is then added to restore the alkaline reaction ; the clear liquid mixed with one part of alcohol or wood spirit ; and after an interval of twenty-four hours cautiously distilled in a very spacious vessel. A watery fluid, containing a little spirit and a heavy oil, collects in the receiver ; the last mentioned, which is the chloroform, is then agitated with water, digested with chloride of calcium, and rectified in a water bath. An impression exists generally in England that the College of Physicians disapprove of wood spirit, and much of the chloroform of the shops, accordingly, is produced by distilling together spirits of wine, chloride of lime, and water. The boiling point of good chloroform is 141° F., that of "Dutch Liquid" 180° F—chloroform is nearly insoluble in water, and is not affected by concentrated sulphuric acid ; the density of its vapour, according to Fownes, is 41° .

The smell and taste of chloroform that is quite pure are very characteristic ; the taste is peculiarly grateful and pleasant ; if rubbed on the hands, the smell of a few drops of pure chloroform should be fragrant and æthereal, to many persons not unlike that of an apartment where the best kind of apples are kept ; if the smell be pungent like that of vinegar, or strong or old æther, the chloroform is impure and probably has free formic acid already as one of its constituents. It is not impossible, too, I think that this "fruity" flavour of good chloroform is due to pelargonic or, as it was formerly called, cœnanthic æther, which is highly intoxicating, but fragrant.

Chloroform is now used in such large quantities in practice, that the proper care necessary for its delicate purification is not bestowed on it. Pure chloroform should be preserved as much as possible in bottles completely filled, and opaque, as light and atmospheric air combined set up a series of gradual molecular changes in its composition fatal to its anæsthetic properties; as æther has a tendency to go into acetic acid, so chloroform goes back into formic acid under the agency of light and the oxygen of common air.

As much of the so-called "amylene" of the shops proves to be not amylene at all, so also many imperfect specimens of chloroform found in the hospitals, "supplied by contract," are found to contain variable but large proportions of free alcohol, hydrochloric acid, hypochlorous æther, common æther, &c., as well as some other compounds which appear to be more of an accidental character, such as aldehyde, water, and methylene. I have spoken already of the latter and its occasional not disagreeable smell of onions, but this, as well as the "pungency" of æther or chloroform, will differ in different patients, according to individual peculiarities. Another death is reported this week, but the chloroform was found to be impure. I scarcely think, however, this was the cause of the death in this case, as reported.

In testing chloroform in general practice a bit of litmus paper will prove useful, as litmus should not be reddened by pure chloroform, but will display a deeper tinge of red according as the chloroform has been spoiled by exposure to the agency of light and air in half filled white bottles, or according as it

contains free hydrochloric acid. Chloroform, when it is adulterated with spirits of wine or ordinary æther, burns more readily and with a larger flame, free of greenness, than pure chloroform does. The specific gravity of pure chloroform is about 1.500, and it would be easy to extemporise or construct a cork or saccharometer that would exactly float about in such a fluid. I find a bit of ivory, or (what is better) a piece of beef-bone cut with a penknife, barely sinks in good chloroform or nitric acid, which is exactly of the same specific gravity as chloroform, while it, of course, goes to the bottom at once of a bottle of æther or spirits of wine; or another method is sometimes adopted: if a mixture of *equal* parts of distilled water and sulphuric acid be prepared, impure chloroform will float on such a mixture, but perfectly pure chloroform will sink; pure chloroform also should show no "milkiness" on admixture with this or with plain water, and pure chlorine is detected in the ordinary way by nitrate of silver.

An impression gains ground very much in France that we ought to have no deaths from perfectly *pure chloroform*, and that many accidents have occurred rather from imperfect specimens of chloroform and overdosing, than from any peculiarity of patients.*

* I am very much in favour of giving "methylated spirit" a fair trial in general dispensary practice for tinctures, æthers, &c. A clamour was got up a little while ago against it, but what a "union surgeon" (who is not usually as rich as Cræsus) can obtain for five shillings of these tinctures or of chloroform, he is charged eighteen or twenty for! I opposed all along this clamour against methylated spirit, and when I asked a chemist, very recently,

A question which always arises in private practice is, whether it is better to use an inhaler or not? This is not a matter of much moment, but the answer is—Yes, the inhaler prevents the lips of delicate private patients being blistered by applying chloroform on a simple cone of lint directly to the face.

I remember a time very distinctly when the late Dr Snow believed the deaths and other accidents from chloroform arose from not using his inhaler, but from surgeons adopting a folded cambric handkerchief in its stead. The fatality attending the handkerchief in "Othello," as I said to him at the period, was not more formidable, but quite as imaginary; we have, however, grown out of this, and although some of the best surgeons in London prefer a piece of lint folded into the shape of a cone, a contrivance always ready at hand, I believe still a simple inhaling apparatus is preferable. In the practice of dentists it is also undesirable to incommodate the gentleman who operates by the vapour of

near St Paul's churchyard, for the "reason why" he objected to it in dispensary practice—"Well," he said, "physicians are of opinion what with diphtheritis, cholera, the malaria of the Thames and other things, there is a great want of oxygen of late years, especially amongst the poor; now methylene is the same, it contains so much carbon, but patients do not want carbon, there is a great want of oxygen in methylene." This argument will "go down" with hundreds of people, but it is one very obviously of no importance; we might as well, with a similar enlightened chemistry, deny the poor working classes the use of sugar or bread or Wallsend coals!

the chloroform escaping from the large sponge or lint.

I will take for granted now that the reader has procured some pure chloroform, and that he is called on, for the first time, to administer chloroform to an adult patient for a capital operation, such as amputation of the lower extremity above the knee; well, how is he to proceed?

From a careful study of ten or twelve thousand surgical operations under chloroform, I am led to the conclusion that a great deal depends upon the fact whether the patient who is about to undergo such an operation has been in a "quiet" condition previously or the opposite, free from feverishness and alarm, &c., or full of alarm; much depends also upon the assistant who applies chloroform, and his general familiarity with operations, some operations requiring a great deal more chloroform than others, and the manipulations in midwifery cases being entirely different from that of common surgical operations, &c.

The patient ought, of course, to have had no dinner or chief meal four or six hours preceding an operation; this is especially of importance in operations for cataract, as Mr Wharton Jones has informed me, more than once, that a radical and chief objection to chloroform in eye operations, especially cataract, is the facility with which the vitreous humour, if at all softened, escapes during these fits of vomiting.

This vomiting may prove alarming, even in other ways. I saw a man operated on, not very long ago, at St Bartholomew's Hospital, for some disease not very formidable in itself; all of a sudden, however,

during the operation he exhibited signs of suffocation and impending dissolution; great alarm was excited, but when it was proposed to pull out his tongue and turn him over on his side, it was found a large lump of hard meat that had been partly ejected from the stomach was stuck right across the pharynx, pressing on the windpipe. If this fact had not been discovered probably the man would have died, and swelled the statistics of deaths from chloroform. In patients who have once vomited, and then subsequently have been rendered deeply anæsthetic, we cannot be too cautious on this point.

It is always well to have a portable galvanic chain or battery in one's pocket, as well as a supply of smelling salts, cold water, aromatic vinegar, wine, and brandy present in the apartment where a large operation is about to be performed under chloroform, not that they are very often used, but it unfortunately occurs that exactly when we require them they have sometimes to be sent for, and great inconvenience is experienced; of the other necessities of the surgical operation itself I need not speak.

I remember a caution Mr Guthrie used to press on Military Surgeons, "Take care of very long splints in fractured thighs;" and, if I recollect rightly, he used to mention several cases in the Peninsula where they had been tried, but the men had died of suffocation, as some slight vomiting had come on at night when least expected or when the nurse was asleep; the vomited fluid matter, however, at once got into the trachea and lungs. I believe a few of the deaths from chloroform have originated in a similar cause. A great number of the early deaths from chloroform, too, were treated by large bleedings,

the idea having been at that time that the patient was dying of convulsions, but it was probably the convulsions of a dying or drowning man!

The theory of the cause of the vomiting under chloroform is not at all settled; one often hears it said "Oh, it is cerebral," but I think that this is an explanation that explains very little; it may, of course, arise from irritation of the par vagum, but why does vomiting appear with such uncertainty, and why does it come on chiefly towards the close of the anæsthetic process? To understand the phenomena of vomiting, we must refer to a few other points.

I am almost sure of the fact, that the vomiting, as a rule, only comes on near the termination of the surgical operation (whatever it may be) under chloroform; coupling this with another fact, that chloroform is almost specific in such diseases as the spasm and pain of gall stones in producing paralysis of the duct, I am inclined to think, as much from the nature of the vomited matters as from these peculiarities of chloroform, that in deep anæsthesia there is a short temporary cessation of the action of the pyloric end of the stomach, with regurgitation of the contents of the duodenum; it may be only a regurgitation of three or five minutes' duration, but it is sufficient—as in bad hernia cases—to cause vomiting. I have some doubts whether there is anything gained by the patient "not having had his dinner," as it is termed; we merely substitute the most distressing nausea and collapse, with paleness of surface, &c., for a good blurt of vomited matter. Whether we shall ever prevent the nausea itself must depend on our knowing its true physiological cause.

“One of the best things,” says Bacon, “in a true philosophy is that if a man will begin with certainties he shall end in doubts; but if he will be content to begin with doubts he shall end in certainties.” This is very true of all that has been written or said of chloroform. It was strongly objected, at one time, that chloroform in midwifery practice, as a dead certainty, made women “drunk and incapable,” and so the “amateurs but not surgeons,” as Mr Guthrie styled such writers, led to endless confusion, as chloroform in midwifery is a real blessing, even without producing complete unconsciousness at all. We have taken for granted that the deaths as a certainty have been chiefly caused by “fatty heart;” then, as a certainty, that the absence of Dr Snow’s inhaler was the “*fons et origo mali*;” now we are not less certain that the vomiting depends on the patient having had previously partaken of dinner or breakfast. The cause is obviously deeper than this. May it sometimes arise, like the distressing “morning sickness” of pregnancy, from some reflex irritability evolved or brought into action by the surgical operation itself? Or may it arise, even as violent purging sometimes arises, from some unexpected action of medicines already exhibited to the patient?

We know very little of the “reason why” medicines have a peculiar therapeutic action on this or that organ; it has occurred to me very often, however, to suspect, in cases in hospitals, that when a patient is fully under the influence of some one medicine — be it belladonna, antimony, &c. — it would be well to defer operation for a day or two. Belladonna seems, in some measure, to antagonise

the action of opium, as curara neutralises nuxvomica. A curious antagonistic action to sulphuric æther—which, like the cyanurets, so paralyses muscular fibre—is found in ehloride of barium, which excites muscular fibre; this, of course, is not a common medicine. Ergot of rye has a specific action also over special parts, and bromide of potassium an influence of an opposite kind, &c. Thus, a patient suffering under delirium tremens was subjected to the influence of ehloroform inhalation; I cannot say why I think it, but he fell forward quite dead; the effect, I think, of a long-continued quantity of necessary medicine disarranging the anæsthetic action. It would seem, from some experiments of Nysten, as if almost any gas or vapour, if it reaches the lungs, will cause anæsthesia. Majendie tells us, long before the age of ehloroform, if an animal be placed in a vessel of common air—a diving bell for instance—and common air be pressed into the lungs, anæsthesia and asphyxia, almost as readily as if there had been no air, are the results. If hydrogen be used, the animal is also anæsthetised; in fact, all our modern anæsthetics arose from a dentist in Connecticut repeating these and the experiments of Sir H. Davy on nitrous oxide, and then trying the vapour of æther!

Not unconnected with this are some experiments given by Bichat, which he was at a loss to explain; experiments where he produced all the phenomena now attending on, and known as, ehloroform anæsthesia, by simply injecting the venous blood of the jugular direct into the carotids of the same animal. Here we see that it is just possible anæsthesia, after

all, may be purely a carbonising negative process, and that chloroform or æther offers simply an artificial stimulus to respiration and to the *par vagum*. Cases of strangulated hernia often come into hospital, the stricture is relieved by chloroform; the bowels, that have not been opened for ten days or a fortnight, perhaps, though croton oil may have been administered, and every variety of purgatives, now begin to act in a perfect deluge—the patient may even die from the rush of matter. Patients, forty years ago, died in dozens from purgatives in this state, the only difference being that then the knife did what chloroform does now—viz., relax the stricture.

The chief corollary I wish to draw, however, is that all medicine should be laid a-side for the previous twelve or eighteen hours where we intend to induce anæsthesia, and that this is as essential as to lay aside dinner.

If æther is, then, to be the anæsthetic, I think in nervous patients it would be worth trying what a dose of extract of conium, or even of chloride of barium, might effect in lessening the irritability of vomiting, and the sense of “touch!” Where chloroform is the anæsthetic, a good deal of danger, I think, may often be prevented by the exhibition of one or two grains of opium immediately previous to the operation, especially if it be a hernia case, or an operation like that for vesico-vaginal fistula, &c. Some surgeons place a suppository of opium in the bowel high up, by a sort of syringe open at the end, after lithotomy operations: the plan is a good one. But it is quite clear that in all these cases we should be acting with greater safety if

the patient for the previous twenty-four hours were rather debarred the use of all other medicines than all kinds of food.

Conversing with the late Dr Snow several times on these points, he opposed them by saying no absorption of opium, &c., took place under chloroform anæsthesia; but even admitting this, it is so much in our favour, as it is exactly when the patient is returned to bed after operation, we have to fear recurring vomiting and syncope. He falls asleep, and the nurse or "sister" does not wish to disturb him; but if he has had his glass of brandy and water before the operation, or his dose of opium, he is safely allowed to sleep.

CHAPTER VI.

DIFFERENCES IN AMOUNT OF CHLOROFORM REQUIRED IN DIFFERENT CASES—CHLOROFORM MORE SAFE IN YOUNG PATIENTS THAN IN ADULTS—VARIOUS THEORIES OF THE NATURE OF ANÆSTHESIA AND SLEEP—OWSJANNIKOW'S DISCOVERIES—THE SURGICAL OPERATIONS IN DETAIL ADAPTED TO EACH OF THE FOUR STAGES OF CHLOROFORM ANÆSTHESIA.

We will take for granted that the reader has procured some pure chloroform, and is called on for the first time to administer that anæsthetic. How is he to proceed?

It would be easy, in continuation of the previous subject of the mode of administration of chloroform, to publish here precise directions as to the specific form of inhaler to be used—the quantity of chloroform, beginning with ℥j. or ℥iss., to be administered—the exact period of time, whether fifteen, or seven, or five minutes—the latter being a fair average in which anæsthesia should be induced in the great majority of surgical operations. It would be easy also to select some one surgical operation, such as amputation of arm or thigh, and describe in a few words for the non-professional reader what is the usual proceeding, as observed, in giving chloroform

either in the operating theatre or private practice ; but I have had a higher object in view, that of delineating the general principles that guide hospital surgeons in the management of this important medicine. No two operations under chloroform are exactly alike: hare-lip in an adult, or staphylo-rhaphy, requires the patient to have "lucid intervals," so to call them, under chloroform, in which, though half insensible, he shall be able voluntarily to assist the operator himself; he must be kept, perhaps, for a half-hour on the verge, as it were, of insensibility, but not insensible; his reflex system must not be anæsthetised. The same patient, if placed under chloroform for other operations, such as an old dislocation to be reduced, or strangulated hernia to be examined, should be so insensible that his reflex system must be completely anæsthetised. As I said before, chloroform vapour, like the odours on the banks of wild thyme of the fairy Titania, in small quantity, may allure to sleep, and to the confusion of common consciousness with dreams, or illustrate all the deadly suffocation of the upas tree! It is thought generally that in the air respired in the inhaler during chloroform administration, 15 per cent. of the chloroform vapour is the maximum which it can contain; but that the inhaler ought never to contain more than 5 per cent. Chloroform acts more safely in young patients, and in smaller quantities, than on old patients, or those about the turning periods of life—45 to 60. This may be explained in one of two ways. either that young patients are saved the dangerous preliminary stage by a large dose of chloroform, or that young patients are free from organic disease.

I believe we shall arrive very soon—indeed, sooner than many persons seem to be aware—at a method of conducting the administration of chloroform—in such operations as amputation of a thigh, for instance—by which the sense of pain may be entirely benumbed or removed; yet there shall be in all cases an agreeable, dreamy consciousness, and sense of “touch” preserved. We may even at present, by some manipulations beforehand, and a judicious administration of small doses of opium, common wine, &c., so change the horrid dreams and nightmare of badly-administered chloroform, that a state almost as bad in some hospitals as amputation without chloroform shall be exchanged for chloroform dreams of an agreeable or soothing kind. I hinted before at female patients, especially when undergoing an amputation of the breast, being held by their poll of hair by ignorant assistants; but we must remember that the sense of “touch” may be most acute in this dreadful nightmare of chloroform thus produced unnecessarily, and that such ignorance merely exchanges one form of torture for another.

Who shall speak of the exact relationship of the sleep of chloroform to the sleep of every-day working life? Yet the difference is not very wide. An ingenious old writer suggests that ordinary sleep is produced once in every twenty-four hours by a certain tiredness of the muscular and vascular systems, which induces a passive congestion in the small veins of the choroid plexus or brain, especially in the former, which then press on the exquisitely delicate parts in contact with them, such parts as the corpus striatum, thalamus opticus, and calamus

scriptorius. We now know, too, that the amount of blood in the vessels of the head is always a constant quantity, the difference being only as to the relative proportions of arterial and venous blood; the more venous blood in the brain, the less arterial blood, and *vice versâ*. The theory of Dr Burrows of an opposite kind is not held by good practitioners. The lining membrane of the ventricles of the brain is a vascular or serous layer distinct from arachnoid, and so connected with the choroid plexus as to prevent communication with the exterior of the brain, and thus points towards some special function of this kind as regards sleep! Lord John Russell delivered a very able but somewhat erroneous analysis of sleep in a lecture a year or two ago, taking as his text the lines in Young, the physiological truthfulness of which he questioned:

“Tired Nature’s sweet restorer, balmy sleep—
He, like the world, his ready visit pays
Where fortune smiles, the wretched he forsakes.
Swift on his downy pinions flies from woe,
And lights on lids unsullied by a tear.”

Lord John Russell argues that “even where fortune smiles” there is often an absence of sleep, and reinforced his argument from personal experience while a Minister, and from the lines in Shakespeare where the King upbraids sleep for lying with the vile, “upon uneasy pallets stretching him,” but denying to weigh the eyelids down of a king. But the truthfulness of both poets is at once apparent; as it is where the brain is in a feverish state, either from emotion or anxiety, in either rich or poor, or where healthy muscular exercise has not been taken, as in the case of a reclusive

minister, that we find this want of tiredness of the museular and vascular system, and consequently absence of sleep. Opium, too, increases the want of sleep; the true anodyne is relaxation from business and museular exercise. Then, as to the mechanism of anæsthesia or sleep, shall we, with Bichât, look on sleep every twenty-four hours as merely the *ensemble* of the successive little sleeps of the senses, one following the other according to a law pretty well established now, by what we see under chloroform administration and the few undenied facts of what is called "mesmerism." The association of the senses one with another is very remarkable: thus taste is the association of the two ideas of smell and touch; if one fails, then taste is lessened; in the same way, if hearing becomes exhausted or fails, as during a monotonous lecture or sermon, the association of ideas from that one of the senses fails; sensation, touch, hearing, memory, thought, like the leaves of a flower, all gradually droop, becoming gradually folded down; confusion of ideas follows, with actual sleep! We have this confusion of ideas also under æther or chloroform; but I scarcely think, as M. Faure does, that the "premier pas" in anæsthesia, as we see it every day in hospitals, is paralysis of the Schneiderian membrane or paralysis of the sense of smell and touch, and subsequently of the other senses. There can now be very little doubt of the truth of the fact, however half eliminated out of the quackery or mystery of mesmerism, that total insensibility or sleep may be thus induced by breaking up the association of the senses generally one with the other by the failure or exhaustion of one of the senses alone!

The failing light of evening, darkening into night, even the accidental darkness of an eclipse, is sufficient to disturb one sense, and then other senses, or association of the senses, one with another in the animal creation, as we observe it in the lower animals. Twilight in "her sober livery" produces that confusion and loss of ideas or forgetfulness that leads insensibly to sleep; but this is aided, too, perhaps, by the tiredness of the muscular and vascular system, already referred to, which supervenes on the toil and toil of the day's work.*

* An interesting letter was published recently in the 'Times' by the Count de Flahaut, who was one of Napoleon's nearest Aides-de-Camp in the retreat from Waterloo. It is stated in many of the false histories of the time, that on the "Prussians coming up Napoleon fled at full gallop, in a terrible fright, for several leagues along the Charleroi road!" But the Count de Flahaut says, the thunder of the cannon—which had continued for three days—gradually ceased, and Napoleon's brain was so exhausted, after three days' tension of his senses on the arrangements of the battle, that he did not "gallop," as said, but went along confused in his ideas anywhere almost that his horse walked! And, adds the Count, he "several times fell asleep on his horse, and would have fallen off had I not held him on." If Lord John Russell's explanation of the lines of Young be the true one—that sleep does not forsake the wretched—but which every day's experience in medical practice helps to negative, then we, the men of war or peace, have only to say, here was a man peculiarly wretched fast asleep, but the whole life of Napoleon disagrees with this "castle-

How varied the fancies of the brain in sleep—many the result of simple physical causes—is familiar to every one. Some writers, who will signify their adherence to any well-paying or popular quackery, will turn into ridicule any man who strives, as regards anæsthetics, to unweave this tangled skein of emotional influences ; the

“Fickle pensioners of Morpheus’ train,
As thick and numberless
As the gay motes that people the sunbeam.”

But much of the art of chloroform administration consists of a psychological study of the emotions which interfere with ordinary sleep, and fill the brain with these “thick-coming” fancies, as well as of a careful study of the symmetrical or non-symmetrical parts of the nervous system.

The senses, of course, belong to the symmetrical portions of the body ; it is not improbable that, in some patients, the functions of all the senses are very early abolished under chloroform. Owsjannikow and other physiologists have recently demonstrated what they believe are reflex or diastaltic fibres, crossing in the spinal cord from and to the sense of “touch.” We know now how powerfully the reflex system, common sensation, and even mental emo-

of-cards” sort of theory. Napoleon, who knew nothing of fear, made war a sort of business or trade ; he had gone through three days’ exhaustion of his muscular and vascular system ; the cannon had stopped, his sense of hearing became disarranged ; hearing, memory, touch, thought, all began to fail ; confusion of ideas followed ; and (the bravest point in his whole life) he was actually asleep !

tions act and re-act one on the other ; it is, to my mind, not at all impossible that nearly all the deaths under chloroform—now numbering over a hundred—have been due to disturbance of these reflex and emotional parts of the cerebro-spinal axis! Dr Edward Smith, who has tried a series of experiments with chloroform, tells me his impression is, that death under chloroform is not at all of the character of asphyxia, as held by some, but is owing to sudden spasm! He has, curiously enough, tried some very exact experiments as to the increase of carbonic acid given off from the lungs by the use of starch, sugar, ale, porter, &c., where we have sugar (the normal stimulus of respiration) in various forms, and he finds that symptoms like those of chloroform intoxication are produced readily by inhaling the vapour of very old well alcoholised port wine; and some articles of diet, such as cheese for instance (like chloroform as found by Dr Snow, and alcohol by Dr Prout), depresses respiratory action, but sugar excites it! Sir B. Brodie also dimly hinted at this a long while ago, arguing from Groves's correlation of physical forces. I took occasion to mention, at the Medical Society of London, in 1856, the peculiar views of M. Brown-Séquard, as they bear on the action of chloroform on the organs of common sensation, and the impression gaining ground at that time that chloroform first stimulates and then acts as a sedative on the self-same grey matter of the cord; we can see therefore how it may act also in a similar way on these curious transverse zig-zag fibres of Owsjannikow, so engaged in reflex and emotional influences. I referred before, at the beginning of this book, to the

fact that chloroform acts on the system in a progressive manner, as if it were absorbed into the blood, and that the surgeon who applies chloroform must be prepared for, at least, four stages of chloroformisation as marked out by nature. [M. Jobert says three stages : one of excitement or exaltation of sensibility; a second of anæsthesia ; and a third of complete prostration.] It seems to me more practical or consistent with actual facts in the hospital theatre to give two stages of excitement, probably cerebral and spinal, and two stages of depression or anæsthesia, cerebro-spinal and ganglionic. It may be said, that a dentist's assistant will apply chloroform and profess to know nothing of these fine-drawn distinctions ; still it is well to know them, as they undoubtedly exist.

It seems to me a good distinction also, easily kept in mind by the educated Surgeon, that chloroform acts first on the symmetrical organs; next on the reflex, or as we might call it, the partially symmetrical, and lastly on the unsymmetrical or ganglionic system. This is a set of distinctions very necessary to observe in ordinary surgical operations : these stages are every day observable, even in the same class of patients, such as cases of midwifery, &c. In the latter, for instance, it is very seldom necessary to annul the ordinary consciousness of the patient ; it would seem as if the patient can be kept for no inconsiderable period in a condition favourable to the expulsive act of the uterus, and yet to be very well under chloroform. My friend Dr Vernon has analysed the peculiar nervous arrangement of reflex and gaglionic nerves engaged in this action with great skill ; it appears, in a word, very much

made up of this sense of touch and reflex irritability, of which we have already treated at some length. There are no cases where chloroform has been so successful as in obstetric practice; one can here also most readily analyse the progressive phenomena of anaesthesia. Small quantities of chloroform or of amylene rather excite and increase the action of the uterus. Dr Murphy has (as this sheet is passing through the press) directed my attention to the possibility of this depending, as he believes now it does, on the removal of mental emotion or anxiety during the labour pains, giving the uterus fair play to act. The action of the uterus may be suspended, but the effect is only temporary, and very much overstated, as the progress of the foetal head is sure to re-establish the ganglionic action. I can scarcely go so far, however, as the able professor at University College, when he says, this suspension in many cases is entirely due to emotional dread of chloroform. Patients, at any rate, are not now as frightened at chloroform as they were five years ago. I constantly see about forty operations a week under chloroform for about fifty weeks of the year, and have been six or seven years perpetually in the hospitals, and my impression is, that the public are taking a more favourable view of chloroform than the Profession has been inclined to yield to them. If we might venture to systematise from what is already stated, and from the numberless facts afforded every year in hospital operations, I think we are justified in saying, there are these four well-marked stages of chloroform inhalation, and specific surgical operations adapted to each :

FIRST STAGE.

In the first stage, simple consciousness is disturbed or excited. In this stage polypi of the nose may be removed; operations on the rectum done; the globe of the eye extirpated; hare-lip operations in adults; diseased bursa from the knee extracted when not done by ice; section of tendons—which (though not very painful) sometimes, like whitlow of the finger, produce a tendency to syncope—or any other operation where we wish merely to dull the irritability and anxiety of patients, but where insensibility would be dangerous, staphyloraphy, for instance, as already referred to. Patients now in hospitals are glad to get what is called a “whiff” of chloroform; the mere fact of complying with their wishes removes a great deal of anxiety and emotional depression.

SECOND STAGE.

In the second stage, or that of spinal or of muscular excitement, Midwifery cases should be conducted; in the later or third stage of complete anæsthesia, delivery is impeded,—the deligation of large arteries seems also more feasible in this second stage, as the muscular and other landmarks for the knife are thrown into relief, the sartorius, for instance, in ligaturing the femoral; in this stage I think hernia cases also might be commenced, as the seat of stricture if muscular is sooner felt, and chloroform is now admitted to be of little value in the third stage in assisting the taxis, especially in femoral hernia. In all gun-shot wounds the French in the Crimea searched for bullets, and operated while the wounded were in this second stage of chloroform; the muscles

were thus thrown into relief, and balls were disengaged more readily. On the other hand, lithotomy, or perinæal sections, should not be performed in this stage, as the perinæal muscles are thrown into violent spasms, and the rectum may be wounded. The reduction of dislocations, or cataract operations, also should not be attempted in the second stage.

THIRD STAGE.

In the third stage, or complete anæsthesia, the reduction of old dislocations, extraction of calculi from the bladder, eye operations, excisions, and resections of joints are all best effected, and the great majority of surgical operations not already specified; such as amputations of limbs, removal of painful tumours, &c., all very painful operations; in a word, more especially where we wish to overcome muscular resistance, and long-continued or excessive pain, or emotional excitement.

FOURTH STAGE.

In the fourth stage, not always reached, but I think mostly always to be apprehended in capital operations, especially where there is weak or fatty heart, and the pulse below par, the patient swoons or faints, and does not recover from the anæsthesia as readily as other subjects.* This sometimes may

* A very remarkable death from chloroform was noticed as occurring at Epsom in the practice of a dentist. The operator used what he calls a *minimum* dose of chloroform. The death seems to have been from syncope, in what I call the fourth stage. I should have continued the best means of resuscitation in this case for at least four hours, viz., at first a few sprinkles of cold water,

occur from unexpected and excessive hæmorrhage, or the "shock" of a capital operation. It is very unpleasant when this syncope appears in the middle of an operation, and it is a strong argument for the administration of wine previously, or substituting it and local anæsthesia or sulphuric æther, where at all possible, for so very serious and dangerous an agent as chloroform. There is of course no surgical operation to be advised in this stage, but a great deal often is to be done in this stage to save the patient's life, such as pulling out the tongue, with a forceps if necessary, tying any bleeding vessels, fanning cold air on the patient, dashing cold water over the face, &c. It is advised to use ammonia, but the patient is probably not breathing: to fill the lungs therefore with ammoniacal vapour, for chloroform vapour seems to me of very doubtful value, care should be observed that a piece of vomited food is not stuck in the pharynx; oxygen or fresh air is what is wanted. The patient should also be turned at once over on his side, as we do not know what may be pressing on the diaphragm and aorta, what fluids may gravitate into and cause static congestion in the lungs, &c. The epiglottis and tongue also

the limbs to be rubbed in the direction of the veins towards the heart (a plan found very valuable in Paris), a pen to be tickled in the ears and on the soles of the feet; the depressing action of the cold sprinkling to be then changed for sudden heat of hot flannels, &c. I am afraid of the Marshall-Hall manipulations, for reasons I explained to that physiologist himself when alive, and galvanism, applied to the par vagum and medulla, actually stops the heart in place of setting it going.

may fall back or close the glottis:—it is to be feared, in some of the deaths which are noted, too much was done. A crowd should be prevented collecting round the patient, and his bed should be at once dragged out into the next open space or hall from the theatre.

As regards this fourth stage, I have been unexpectedly furnished with some interesting facts from Guy's Hospital, by Mr Bryant, in which I can trace the contrast of the operations performed in the time of Mr Aston Key and Sir Astley Cooper, without chloroform, and those at present under Mr Cock, Mr Hilton, Mr Birkett, &c. I believe Mr Bryant, who has seen more of the after-treatment of cases operated on than any surgeon in the borough, is peculiarly qualified to speak on this point. Mr Holmes Coote and Mr Stanley, at St Bartholomew's, have also recently made similar contrasts of operations, as done twenty years ago, and now done under chloroform. I have the statistics and suggestions of those two leading schools, they agree in some measure as to the accidents from the after-effects of chloroform, and quite fortify my original impression of the danger of this fourth stage; it is often marked by vomiting and faintness. Mr Bryant calls it recurrent debility or syncope. The patient is taken back to the ward comparatively "quite right" after his operation, but he falls back again into a stupor, from which it is difficult to rouse him up. From what I have seen of this stage, it seems entirely different from that of convulsive action in the preliminary steps of anæsthesia, which proves fatal. A man was operated on at Guy's for stone this year by "Allarton's plan," so remarkable for absence of

hæmorrhage ; he fell deeply into this fourth stage, he seemed quite impassive to every conceivable mode of rousing him up, and was for a quarter of an hour looked on as dead. Happening to be present, I advised to continue the means then adopted, even for five or six hours if necessary ; but if it had been the sudden convulsive fit of the early stage of chloroform I should be entirely without hope. The poor man recovered, but it took at least five or six hours to bring him round. If we might venture on an explanation of this fourth stage, it might be said to depend on a return of imperfectly decarbonised blood, as in the latter stage of epilepsy, to the brain.

CHAPTER VII.

CONTRA-INDICATIONS TO THE ADMINISTRATION OF CHLOROFORM—ACTION OF MEDICINES LIKE HYDROCYANIC ACID, DIGITALIS, ANTIMONY, CROTON OIL, &c., COMPLICATE THE PHENOMENA—SMALL OPERATIONS SOMETIMES VERY DANGEROUS — PROFESSOR MILLER'S LAW OF TOLERANCE — DELIRIUM TREMENS, HYSTERIA, WEAK OR DILATED HEART, EPILEPSY, &c.; EXISTENCE OF ANY OF THESE CONTRA-INDICATES THE USE OF CHLOROFORM.

It may be asked, even before we proceed to the application of chloroform, Are there any contra-indications to be thought of in its administration? any precautions to keep in mind? I believe there are a great many. If I have dwelt so much on the necessity of recognising certain stages in the chloroform process, and if I have spoken of the necessity of intermitting the use of strong medicines like croton oil, hydrocyanic acid, digitalis, tartar emetic, &c. (and these are no wild fancies of mine, I can assure the reader),—it is with the serious and sobering fact before us, that in such surgical operations as that for strangulated hernia, where croton oil has been used, the life of the patient depends very often on his not having too much, or his not having too

little chloroform: the patient is going down an inclined plane, from which it will be difficult to rescue him. If a common assistant of a dentist, or a second year's student for instance, administered the chloroform, in such case this inclined plane would probably end in the patient's grave. In cataract, again, if the vitreous humour be softened, we must be careful for vomiting, or the patient will be stone blind for the rest of his life; though I do not exactly go as far as Mr Wharton Jones on this point,—as I have seen, literally, hundreds of operations for cataract at other hospitals under chloroform without any evil result ascribable to the chloroform. I should be afraid of chloroform where the patient had been previously using, as a medicine, digitalis or hydrocyanic acid, &c., or had suffered from “mania a potu,” simply because these things, like epilepsy or hysteria, interfere with the usual normal progression of events under chloroform. Sometimes, on the other hand, we make a sort of compromise with the patient's judgment; and in such trivial operations as amputations of fingers, evulsion of toe-nails (which I have seen beautifully done with congelation by ice), Wutzer's operation for hernia, &c., we allow the patient to have chloroform, as that alone helps to banish a thousand fears from his mind; but as the patient is probably argufying, and before he is completely under the anæsthetic, the operation, in the twinkling of an eye, is performed! Patients have died under chloroform while a whitlow was being opened, a syphilitic wart removed, and another from ligaturing a hæmorrhoid, or extraction of a tooth. Professor Miller has recently made some remarks on a “law of tolerance,” that where a

patient is labouring under great irritability and pain, he bears chloroform best ; this is only another explanation of the view I have taken, that patients bear large operations under chloroform best ; but deaths occur in the early stages, or from hysteric affections, or epilepsy, or delirium tremens, as may be perceived from the following contra-indications to chloroform :

1. A patient may take chloroform three or four, or more times, and yet die on the fifth or sixth, from lessened or altered irritability ; or from what is not at all impossible, viz., the use of impure chloroform, or the supervention of a new disease, such as delirium tremens.

2. Any unusual *difficulty* in bringing a patient under the full effect of chloroform must always be looked upon with very great cautiousness, if not suspicion, as the absence of tolerance, or cumulative doses of chloroform in one part of the nervous system may do mischief in another part, when least expected, ex. gr., the largest amount of chloroform that may not be able to annihilate the sensibility of an over-sensitive ulcerous skin, in a diseased limb, before amputation, may annihilate the action of the brain or a weak heart, without the slightest chance of recovery. In some of the older or earlier deaths by chloroform, we now read of chloroform used by the half-ounce at the time poured into the inhaler, and on pocket-handkerchiefs. One hears also of "recurring syncope" from this state of things. Occasionally, I have known patients obliged to be removed from the operating table, as no amount of chloroform seemed to affect them or to establish tolerance ; here it would be obviously

wrong to continue its application, for fear of the bad effects of the cumulative doses. Hysterical women, as I said previously, require large quantities of chloroform, but, as a rule, we should never in such cases pour more than 3j into the inhaler each time.

3. Various lesions of the vascular system, such as atheromatous deposit in the arteries, or fatty or dilated heart, have been also forcibly urged as causes of death. When we remember, however, that one of the first effects of chloroform is not to depress the heart, but to stimulate it, one cannot help believing that, perhaps, too much emphasis has been laid on this single sign as a contra-indication to the use of chloroform. It is always right to pass the ear over the chest and examine the heart before applying chloroform. It must not be forgotten, however, that in deaths from chloroform the heart is sometimes found firmly constricted and healthy.

4. It has been recently urged that the existence of hysteria in patients is almost sure to lead to death. If such patients be placed under chloroform, the latter is required in such quantities. Tetanus and epilepsy also contra-indicate its use. Opisthotonos was very common under anæsthesia! I have occasionally seen patients with complete opisthotonos, the result of chloroform. Emprosthotonos is very common. A tendency to faint is also a very dangerous complication!

5. A full stomach must be avoided at the time of operation under chloroform, as impeding the action of the diaphragm. The depression or emotion of fright is also a thing to render the surgeon doubly cautious; the chloroform dream, so to speak, may be influenced by fright.

6. Excess of venery and masturbation have been much dwelt on also by continental surgeons, as weakening the spine and destroying its proper reflex irritability, and if suspected in patients, it should prevent their running the risk of complete paralysis from chloroform. I may say I do not entirely agree with Professor Miller's idea of a "law of tolerance," but it may be accepted, provisionally, as the best interpretation we have yet of the fact I have dwelt on, that the deaths occur under chloroform independent of the seriousness or extent of the surgical disease or operation for which chloroform is used.

CHAPTER VIII.

LOCAL ANÆSTHESIA BY ICE A SUBSTITUTE—CON-
TRAST OF THE SAME OPERATION AS PERFORMED
BEFORE AND AFTER THE DISCOVERY OF
CHLOROFORM—RESECTION OF JOINTS ENTIRELY
DUE TO THE BENEFITS OF CHLOROFORM.

There are two classes of practitioners for whom, chiefly, I have intended the various observations already made on chloroform and æther. One set of men to be met with in hospitals very often commit mistakes from too much boldness or recklessness in the administration of anæsthetics; others are intimidated for want of hospital experience—though ever so willing to give chloroform a fair trial, they seem to know nothing about it. If I am anxious “to bestow all my tediousness” on the reader, it is due to the fact that some recent very remarkable deaths from the use of chloroform, as well as the great uncertainty still attending its inhalation, have led me to the conviction that the danger attending the administration of this uncertain but popular agent is, perhaps, still too much underrated by practitioners, and that by re-opening the subject completely, and continuing to collect observations together, more certainty might be introduced into the subject, and our increasing experience every

year serve to dispel various prejudices so long gaining ground. It has occurred to the writer also, as doubtless to many other practitioners, to be obliged to admit that the value of local anæsthesia by freezing or ice, in some surgical operations, has been also too much underrated,* more particularly

* It may be practically useful to give a few of Dr Arnott's directions for the ice and salt anæsthetic. I had occasion to try it myself this month and with good effects: "Although there are several modes of employing intense cold as an anæsthetic, I shall here confine myself to the most simple and generally applicable of these—viz., the placing a frigorific mixture immediately on the part, or with the interposition only of a piece of thin gauze or tulle containing it. This piece of gauze (formed, for the sake of convenience, into a small net or bag), the components of the frigorific mixture, a canvas bag or coarse cloth, a mallet or flat iron, a large sheet of paper, a paper-folder, and a sponge, constitute all the articles required for congelation. The common frigorific of ice and salt will generally possess sufficient power; when greater is required, saltpetre or an ammoniacal salt may be added. Every systematic work on chemistry contains tables of frigorific mixtures, as well as instructions for making ice, which, when but a small quantity is required, may be thus artificially procured almost at as little expense as from the fishmonger.

"A piece of ice the size of an orange, or weighing about a quarter of a pound, will be sufficient for most operations. It is put into a small canvas bag or a coarse cloth, and beaten, by the quickly repeated strokes of a mallet or flat iron, into a fine powder. As it is important that the powder should

in hospital practice, and that if chloroform were not in such every-day excessive use, we should hear of fewer accidents, more especially amongst persons outside the Profession. Ice and carbonic acid, as local anæsthetics—in fact, together with chloroform—offer a wide field for research; in which, every day, new facts are being turned up.

So much is now ascertained of the usefulness of ice as a local anæsthetic,—we see it act so well in private practice so often, where chloroform is forbidden—that some comparative results of anæsthesia after ice, and anæsthesia after chloroform, must have already impressed themselves on every operating surgeon's mind. Chloroform, it must not be forgotten, is not in too much favour with some surgeons,—as one of our chief collegiate surgical

be fine, it is not ridiculously minute to state, that the bag should be turned in various directions during the pounding, and that the pounded ice, squeezed into a cake by the iron, should have its particles again separated by rubbing the bag between the hands. Instead of pounding it, the ice may be pulverized by the ice-plane.

“The pounded ice having been placed on a large sheet of paper, any loosely-cohering particles may be separated by a paper-folder, and the un-reduced larger bits removed. Beside it, on the paper, about half the quantity of powdered common salt is placed, and they are then quickly and thoroughly mixed together, either by the ivory folder while on the paper, or by stirring them in a gutta percha or other non-conducting vessel. If the mixture be not quickly made, the extreme cold of one part of it may again freeze other parts into lumps.

“The mixture is now put into the net (which may

teachers in London lately stated in public, at a leading hospital, that the day was not far distant when chloroform would have so disappointed the world, that it should be as completely forgotten as the elixir vitæ or philosopher's stone! It cannot be said that one shares in this opinion with any satisfaction or pleasure. It may be so, but we shall have got, perhaps, some other anæsthetic better than chloroform. Again, we have persons with a very large and abounding faith in the virtues of ice or æther anæsthetics, either of which is to supersede chloroform some particular month and year! We must make allowance for immature exaggerations on the part of the enthusiasts for ice on one side, of chloroform or æther on the other. In avoiding one excess of zeal at one side, we have had lately a

be conveniently supported and preserved from contact by placing it in the mouth of a jar or ewer), and as soon as the action of the salt on the ice appears established by the dropping of the brine, it is ready for use.

"In applying the net, the part which is to be benumbed should be placed in as horizontal a position as possible; and it is well to raise the net for a moment every three or four seconds, in order to secure the equal application of the frigorific, and watch its effect. If the part be not horizontal, it may be necessary to hold the gauze bag containing the frigorific against it by the hand covered with a cloth; and if the net does not cover the whole of the surface to be benumbed, it must be passed to and fro over it. A moistened sponge placed lower than the net will absorb the fluid escaping from it, or this, on some occasions, may be allowed to drop into a basin placed underneath."

tendency in this subject, after the classic maxim, to run into an excess of another kind on the opposite side. Individually, I have seen very bad effects from both ice and chloroform used as anæsthetics. Neither is entirely perfect; it is only just to add also, however, that the good effected by both agents far and immeasurably preponderates over the evil. Ice or chloroform is almost equally dangerous if not used with proper precaution; ice leading to mortification of limbs and frost-bite if used unscientifically or for too long a time, or, as I have seen it, causing sloughing, and in a few cases preventing the healing of wounds made for removal of tumours, not otherwise serious,—while chloroform may lead to fatal syncope or asphyxia ending in death, as is too familiar to us all. The danger attending ice or chloroform is not very great—it cannot be said too often—if the proper administration of either of these agents be observed or understood. An overdose of ice, or an overdose of chloroform, will probably kill with as much certainty as an overdose of opium. It is said one death in ten thousand cases is sufficient to condemn chloroform on moral grounds; but we are here arguing against the *use* of a most valuable remedy from its abuse. An overdose of opium will kill, but if it were not opium it would not produce all the very estimable blessings of opium in producing sleep. Opium and prussic acid cause death, but that does not, in a *moral* point of view, prevent well-educated practitioners recognising them as the most valuable agents on which they can sometimes rely—as, for instance, in pain and palpitation of the heart.

Chloroform, as the most efficient agent we at

present possess for the removal of pain, promises to remodel or revolutionise the entire science of surgery. Some operations are now undertaken, and undertaken under the most unfavourable circumstances, which were not previously advised at all on account of the long-protracted pain; thus, excision of joints may be cited as altogether a new page in surgery, which we owe, not to this or that surgeon, but to chloroform. The late Sir P. Crampton, and Mr Syme, and Mr Abernethy gave up "excision of joints" in despair, on account of the pain!

In females, again, about to undergo what they conceive a very formidable operation, even under chloroform, such as the removal of a breast or limb, everything to their minds is very frightful; the emotional parts of the brain, and those connected with intelligence, are those most excited. I have seen women who had been reading about it even refuse chloroform, as they could not conquer a dominant idea they would die under its effects, as described by some doctors. It is interesting to observe that this excitement or irritation of the cerebral lobes (so much engaged in the emotions and intelligence) does not cause convulsive movements in these women, or plunging, but leads rather to manifestations of excited operations of the mind, followed by heavy sleep; and we here go back to the first and third stages, and the woman, like the child, talks or sings, and recounts half her life as if in a dream, but suddenly, without much plunging, falls off into the third stage of complete anæsthesia or sleep,—as corroborating the various proofs of the special function of the anterior lobes of the brain, as connected with intel-

ligence. I may mention here, a grown-up girl often seen at St Bartholomey's Hospital in perfect health, but in whom the whole front of the forehead above the frontal sinuses may be said to be absent, from a surgical accident—the dura mater and brain are observed pulsating under the skin; the child has never had convulsions, and is only stupid if one presses the part. In another poor child, during the past couple of years, a large piece of a glass bottle was driven forcibly into the brain in front, and during an entire week there were no convulsions, nor no symptoms of any kind, in fact, to indicate such an injury. We have not much to fear, therefore, from the action of chloroform on this anterior or intelligential part, though this is perhaps the first, or amongst the first, parts of the brain affected by it. Contemporaneous with this change, another however, especially in male patients, is also observable, viz.,—a specific irritant or convulsive action of the chloroform on the tubercula quadrigemina and pons; the patient's limbs are convulsed or flung wildly about; one, in fact, now and again recognises a curious similarity, if not identity, between this stage of chloroform and an ordinary fit of hysteria or epilepsy. It is not at this *second* "convulsive" stage, I think, that the fatal *fourth* stage, or "syncope," is suddenly to be feared. This second stage, when well marked in male patients, is generally looked upon rather in a favourable light than otherwise; it certainly shows that the spinal system is healthy, but not yet paralysed. Consciousness is not entirely abolished in this stage also, so that it is more like hysteria, perhaps, than epilepsy, and I believe the means of resuscitating patients in

impending death in the second or fourth stage in syncope or asphyxia—as in the two last cases of death at Epsom and Towcester—are quite and entirely different.

The increased sensibility of the lower limbs especially shown every day in hospital practice, in convulsive attacks, such as tetanus, epilepsy, hysteria, puerperal convulsions, &c., all depend on a peculiar condition of the anterior column (?) and the ganglionic centre of the spinal cord, which condition occasions these movements, without the patient's knowledge or consciousness; all these are very singularly excited too by chloroform, as in the epileptic plunging of patients, sickness of stomach, convulsive action of small perineal muscles, &c. M. Brown-Séquard terms the fifth nerve the most sensitive nerve in the system; this explains why it is so late in coming under the effect of chloroform, and that touching the eyelids or conjunctiva, as I said before, is not the most delicate test of anæsthesia under chloroform; but the *last test*—we have nothing beyond it. It is not yet exactly known what nerves supply the inside of the skull; hence the difficulty of explaining some of the phenomena of ordinary headache and sickness after chloroform. The remedy, however, I find most useful for the latter is carbonate of ammonia in a state of effervescence, soda water and brandy, and sleep.

I have recently witnessed within a single week two cases that illustrate the advantages of chloroform, as regards the comfort or recovery of the patient, as well as half-a-dozen other cases in another week that show how variable the proportions or quantity of chloroform required for different opera-

tions ; some operations requiring only §ii. of chloroform, other operations §iv. and §v. !

One of the first cases was a patient operated on at Guy's Hospital ; it was an old case of resection of the elbow-joint, in which eighteen years previously Mr Aston Key had performed, or had striven to perform, this then very novel experiment, leaving the poor man (who is a letter-sorter in the General Post Office) a very imperfect use of the elbow and forearm. The man had a most perfect or correct recollection of the agony, torture, and horrors of the first operation, and wished now for amputation of the limb, which had recently begun to pain him very considerably ; this, however, was denied him, and it was explained to him that the parts could now be explored and cut into without any pain ; he said he could sooner die than go through Mr Key's operation again—yet go through it he did, like a child asleep, and on my speaking to him when consciousness was restored, and he opened his eyes, he wished only to know when the horrid operation would commence, for he had been in a beautiful dream—not knowing, poor man, or associating in his dreams all the ancient gouges, saws, mallets, knives, &c., that had been again delving and cutting through his elbow, and half forgetting, or puzzled to find, that the “ivory gates of sleep,” with all the sawing of bones and blood, through which he had now again passed a prisoner, were no longer guarded by the dogs of the inferno, painted so deeply in his memory, but by the gentle spirit of chloroform !*

* Somewhat different from the views of Shakespeare, Young, &c., as referred to previously in

Such an operation as this, I may here say, would require \S iii. of chloroform; such an operation as iridectomy, \S vi.; lithotomy or cataract, \S iv.; cases of club foot, &c., even less, or about \S ii.

In the second case above alluded to, the operation of amputation at the hip-joint was performed under chloroform at St Bartholomew's, but Mr Stanley quoted the opinion of Mr Abernethy, out of some manuscript notes, where Mr Abernethy said that on

Lord John Russell's lecture, the ancients spoke of "two gates" to the Temple of Sleep, in which I think I can detect a reference of an obscure kind to one gate for entrance to the refreshing fountains of true sleep.

"Qua veris facilis datur exitus umbris,"

from whence the tired spirit re-enters the world refreshed, and where the soul is strengthened by a new stock of "innate" ideas. We know, for instance, that Byron and Coleridge both state the fact that they composed some of their exquisite bits of poetry in this state! The other "gate" of sleep is represented as being made of more polished and perfect ivory, "the gate of false visions and dreams," where the sensorium or "internal sense, made up of soul and spirit," as termed by the leading philosopher of Europe, lies a prey rather to the rough jostling of the external world and external senses! In chloroform anæsthesia we have more to do with the latter than the former condition of the brain and external senses, and, as I have said more than once, when chloroform is properly administered with due regard to external sensorial impressions we may change a horrid night-mare into a refreshing and delicious dream, and thus take advantage of our poetieisings.

account of the "pain" this operation ought never to be described in lectures or attempted! Yet, as a "secondary" amputation, the vessels tied as the surgeon goes along, this operation is now often performed with a considerable share of success. In point of fact, as remarked already, this operation, as well as all, or nearly all, our modern resections, of which there have been now some hundreds, as well as our large and tedious plastic operations in the female, are all the result directly of the discovery of anæsthetics and chloroform, as surgeons could not conscientiously attempt resection of the knee, for instance, in the absence of chloroform.

CHAPTER IX.

CHLOROFORM IN OBSTETRICS—EXPERIENCE OF
THE SCHOOLS OF DUBLIN, LONDON, AND EDIN-
BURGH—DEATH FROM CHLOROFORM.

I referred before (Preface) to the weak objections urged usually against chloroform in obstetric practice. We have a want in London, that there is really not one "Lying-in Hospital" for general instruction in obstetrics. One gets reconciled to this as a matter of humanity after the recent debate in Paris on puerperal fever; but it is to be feared our statistics on this subject, as regards chloroform, will long remain very imperfect.

Professor Dubois speaks well of the extreme laxity induced in the muscular layers of the perinæum under the effect of æther, even in primiparæ, with a state of anæsthesia kept up only for an interval of a quarter of an hour, the uterus after delivery regaining its firm contracted condition. Dr Simpson found under æther in some patients a state of apathy and insensibility, other poor ladies moved about and told their sorrows over during uterine contractions with an unusual misery and mystery, but forgot all about it when common consciousness was restored; yet in all, the uterine contractions continued as regular as before the inhalation had

begun. I believe, however, from what I have seen of ehloroform in anæsthesia of parturition, that it renders the labour a little slow, it requires also some little caution, so as not to go beyond the earlier stages. I find it to be an admitted fact, however, that a great deal more mischief occurs to the infant from the foreeps and sceale cornutum than from ehloroform,—the ergot acting sometimes directly as a poison, as well as keeping up pressure of a contracted uterus on the circulation in the funis.

I deem it right to state that I have been very much disappointed in the result of certain inquiries I set on foot this year bearing on ehloroform in obstetrics, though I have found no difficulty whatever in arriving at superabundant data on ehloroform in other departments of surgery. Not a few of the leading men associated with obstetric practice in the professional mind have informed me, as a matter well known, that they do not attend ordinary midwifery cases; that they have not taken any new cases during the last six or ten years since ehloroform came in, &c. &c., so that it is in a direction quite different from what is generally considered in London, that we shall have to look for any reliable data on this subject, in the maternity department of our large hospitals I have found a large number of most valuable statistics; if I shall have succeeded, however, in inducing some men to think the subject over, one of my leading objects in this work will be attained; we must not, however, go on copying the useless controversies in such books as that of Dr Ramsbotham, for whom, in everything else but ehloroform, as an *habitué* of the London Hospital, I have a great respect.

As we have no large lying-in hospitals in London at all like the Rotunda at Dublin, or hospitals in Vienna or Paris, we have no statistics.

In 360 cases of poor women chiefly out of hospital, under the administration of æther, and 180 under chloroform in the practice of one leading obstetric physician, and 1,519 women delivered while under the effects of chloroform alone by another, there was not the slightest accident or casualty traceable to the anæsthetics. One cannot help harbouring a suspicion, that if there had been even half a dozen deaths and inquests in these two thousand cases, it would have been fatal to chloroform in obstetrics.

I have been favoured with the impressions of some of our leading men on the subject, and on one side I think I may fairly range the experience and practice of Sir C. Loeck, Dr Murphy, Dr Montgomery, Dr Rigby, Dr Beatty, Professor Simpson, as well as several French and German medical men that I have met in the hospitals. On the opposite side, Dr Lever of Guy's, Dr Ramsbotham, Dr Barnes, hold no inconspicuous places as opponents of chloroform, while, in point of fact, the men who really know most about the subject from actual experience are Dr Murphy, Dr McClintock of Dublin, Dr Beatty, Mr Baker Brown, and his able assistants at St Mary's, Professor Simpson, Dr West, Dr Waller, Dr Chowne, and a few others.

As a practical summary of the phenomena of ordinary chloroform inhalation, in its three stages (page 8), I know of no class of patients which so well exhibit these stages as an ordinary case of labour; premising only that the expression of the

patient's feelings by herself, is not an actual measure of the amount of pain endured, as she will often cry out hysterically when there is no pain whatever, while, on the contrary, she is calmly dreaming of some innate fancy of her baby or husband—she is anticipating “the joy that a man is born into the world,” but in no pain whatever, exactly at a moment when other poor women suffer most intensely. I have not described what takes place when a patient is placed under chloroform, as it is a thing every one should see for himself. The amount of chloroform used need be very little in midwifery cases. Dr Snow mentioned to many the particulars of the case in which the tenderest sympathies of the public were twice excited on certain memorable occasions, and the quantity was very small. Zi of chloroform by measure varying to Ziss , is what Dr Murphy uses at first, some patients will do with less, and the inhaler or sponge should be withdrawn in the intervals of the pains, as the tendency of the chloroform itself, it must be admitted, especially in some cases in the early stage of the labour, when the purely reflex nerves are acting, is to lengthen out these intervals, and make the labour somewhat slow, a recommendation I fear of no favourable kind to the Poor-law surgeon or general practitioner, to whom time is money, but amongst whom terrible tales are told of the mischief done by ergot and forceps! I merely say this, as it explains why a mass of professional prejudice has grown with the growth of chloroform in the favour of the public, and that the same agitation got up against the use of ergot or forceps, if founded on the number of deaths these agents produce would do more good. The chloroform, as I said before,

should be as much as possible restrained in ordinary labour cases to the point of the second stage (page 9). In cross births, however, or necessary operations with instruments, or for the space of a few minutes, as the head of the infant is pressing on the perinæum, it is right to go on a slight shade farther into the third stage.

Dr Lever tells me of a class of cases where he has found chloroform very valuable, though his general impression is against chloroform in obstetrics, they are cases where there is transverse or other troublesome presentations, and it is desirable to turn ;—Dr Murphy also has reminded me of cases where the cervix of the uterus itself is compressed between the foetal head and pelvic bones, the pain here is often very great, nay the os itself may not be dilated at all, in the midst of this chapter of horrors ! But here chloroform pushed into the third stage is an invaluable boon, nay, it will prevent convulsions like a charm, while the old routine man is looking for his lancets to bleed the patient ! The first effect of chloroform is merely to blunt the pains of ordinary labour, then the patient complains of a tingling sensation through the arms and legs ; the arm perhaps fails to hold on by the towel tied round the bed post, the pulse is tranquil ; she says, “ I know I have a pain, but yet I do not feel it ; ” but she may speak of palpitations or vertigo, or feel frightened, and the friends refuse to let her have any more.

Here the moral courage of the physician is often put to a severe test, and I doubt if the doctrine of some surgeons holds good, that chloroform must be always decided for by the patient. She exaggerates

her pains as already referred to, and these dreamy fancies take on a form of rather anxious incoherency she or her friends are no judges at all. The experienced physician, however, is not frightened, no more than the surgeon in the hospital theatre at the patient's kicking about, rambling and singing of songs, &c. I don't understand a fine drawn vain opinion of some learned Thebans, that there is pain, but no memory of pain, it is like Dr Colc's idea that pain is a stimulus! It is desirable to be careful as to certain examinations made,* and to use the greatest

* We have a vivid picture how external sensation re-acts on the brain proper during sleep in the description of Queen Mab in "Romeo and Juliet."

There has been no use ever made of some of the curious legends picked up and edited by Mr Crofton Croker; many of them are tales not unlike this of Queen Mab, to which one may at least safely refer for descriptions of ordinary and extraordinary anæsthesia or intoxication, those of the legends that are not of geological origin; begin in some fanciful manner about banshees, pookahs, or pixeys, then branch out into the wide territories of the land of dreams, and end by the dreamer finding himself suddenly woke up, as his wife or the landlord finds him, asleep under a table, having drained the last drop of his bottle of whisky made in a bog-hole, and very full of what we now call amylenene or potato spirit! The description of Queen Mab is so exquisitely true, as a physiological fact, it is deserving of study; and, as the sailors on the island, under the spell of Prospero and Ariel, "standing, speaking, moving," though asleep, refer to what we now know as somnambulism or a special condition of the cerebellum, Queen Mab

kindness and mildness, as the mind of the poor woman for a short interval is in a state of dreaming, from which of course it is quickly set free. I give here some of the less favourable results of chloroform, which have also been ridiculously exaggerated in our medical literature, and too often remind me

typifies an analogous state of the cerebrum and external feeling:—

Romeo. I dreamt a dream to-night.

Mercutio. And so did I,

——— that dreamers often lie—

Romeo. In bed asleep while they do dream things true.

Mercutio. ——— Queen Mab hath been with you,

She is the fairies' midwife, and she comes

Drawn with a team of little atomies

Athwart men's noses as they lie asleep.

* * * * *

Her whip of cricket's bone; the lash of film,
Her waggoner, a small grey-coated gnat:
And in this state she gallops night by night
Through lovers' brains, and then they dream of love;

O'er lawyers' fingers, who straight dream of fees;

And sometimes comes she with a tithe-pig's hair

Tickling a parson's nose as he lies asleep—

Then dreams he of another benefice.

Sometimes she driveth o'er a soldier's neck,

And then dreams he of cutting foreign throats.

————— and then anon

Drums in his ear, at which he starts, and wakes,

And being thus frightened swears a prayer or two

And sleeps again.

of Bacon's sensible words, that in whatever is great, and new, and true—"a mixture of a lie doth ever add pleasure;" for doth any man "doubt that if there were taken out of men's minds vain opinions but it would leave them poor shrunken things, melancholy and unpleasing to themselves."

Professor Montgomery tells me that chloroform has been found generally satisfactory in Dublin when judiciously used, he has never known it to produce or aggravate mania; if chloroform be given too freely it certainly debilitates the uterine contractibility, and leads to *post partum* hæmorrhage, and for the same reason will of course impede labour! This experience of chloroform in Dublin I obtained without offering the slightest idea of my own opinion on the matter. Dr Murphy, who has used chloroform continuously for ten years, whose statistics I have already given, writes to me, professing his great delight that chloroform is emerging out of the darkness of former times:—"I confess I am greatly surprised," he says, "at the boldness of the statements made as to chloroform: so far from causing mania or anything like it, I find one of its greatest advantages to be the rapid and favourable recovery of the patient, and for this alone I should use it, even if it did not relieve pain, but the relief of pain saves nerve force, and enables the patient to resist those causes of fever and inflammation which so frequently interfere with a patient's recovery." Dr Murphy believes that the action of the uterus under chloroform is not generally interrupted, and hundreds of women are delighted with the relief that chloroform affords. Dr Rigby gives similar evidence to Dr Murphy. The same dose of chloroform given in the same manner pro-

duces different effects on different constitutions, as I referred to previously in the art of dentistry. There can be no doubt that there are many things calculated to embarrass a practitioner in the sick room; the female's friends and *sage femme* hold many a deliberation on the metaphysical subtleties of chloroform, and mania, and the new baby; and if the advocate of chloroform in obstetrics has the misfortune to have some "discreet and experienced practitioner" brought into consultation, I agree with Dr Murphy that the fears and metaphysics of the *sage femme* will be confirmed, and chloroform banished in all future labours.

Dr Ramsbotham gives, in this way, a case of so-called death from chloroform in obstetrics; it was the poor woman's fourth child, and in the first labour the long forceps were found necessary; in the three subsequent labours she had chloroform, which agreed admirably with her; but in her last labour, though she went through it very well, and the uterus contracted very well, it was found that at the end of an hour and a half distressing dyspnoea came on; this was soon followed by convulsions, and death. It seems she had never been totally unconscious, and frequently "expatiated on the relief afforded her." I think, if not a death from some cause irrespective of chloroform, it was a case of what I have called recurrent syncope or fourth stage, and probably the proper means of resuscitation were not tried. Dr Ramsbotham speaks of the chloroform as discontinued for five hours, so that it was certainly not a case of what would be commonly called death from chloroform. Another case recently in Paddington, where the woman had been under chloroform, was even still more problematical as to

its depending on chloroform. Occasionally distressing vomiting continues ; the best remedy is, as Dr Rigby and Dr Druitt advise, effervescing draughts and a mild purgative ; the latter is quite in accordance with my hypothesis of the cause of vomiting.

CHAPTER X.

NATURE AND CAUSES OF DEATH FROM
CHLOROFORM.

Having mentioned the several contra-indications to the use of chloroform in surgical practice, as well as described the two modes of resuscitation in impending death,* and as I believe death is not a necessary result of the administration of this agent, but an accident, it will be necessary to say only a few words on the nature and causes of this terrible accident. The majority of tens of thousands of patients under chloroform are relieved from the most

* I do not know that I have any particular remark to make on a communication by Mr Lobb, who doubts if my statement be true that electricity along the eighth pair of nerves, when tried for the purpose of reviving the action of the lung, stops that of the heart; but if Mr Lobb will try the experiment, as referred to by Mr Paget and Mr Huxley, and not mind "books on physiology" of fifty years ago, he will probably come to the same conclusion as the first physiological lecturer in England on this subject. There is a good deal of quackery about electricity at present, the "post hoc" cures put for "propter hoc," but I believe this experiment is of a different kind, and new!

horrible agony, "shock," and suffering of a cutting and sawing operation, but we hear very little of the fact, whilst a single death naturally excites much alarm. Thousands of patients rejoice like Endymion—one would think he was speaking of æther—

"Long in misery

I wasted, ere in one extremest fit,
I plunged for life or death. To interknit
One's senses with so dense a breathing stuff
Might seem a work of pain; so not enough
Can I admire how sweet a dream it felt!

At first I dwelt

Moving but with some mighty ebb and flow
Forgetful utterly of self-intent.
Then like a new-fledged bird that first doth show
His spreaded feathers,
I tried in fear the pinions of my will."

As to the immediate cause of death from chloroform, or the mode in which death occurs, it is singular how opinions vary. Gibert, of St Louis, in Paris, one of the latest authorities, is satisfied all deaths in France have been from convulsive fits or syncope; in Germany too this opinion prevails, and they believe that air is evolved in the veins from want of tonicity of their coats. In England, on the contrary, very many of the deaths, especially those in the infancy of anæsthetics, have been decidedly from bad management and asphyxia, with stertorous breathing; in every ten cases of death I find the proportion to be about four asphyxia and six convulsive fits or syncope! I have looked carefully through the old deaths from chloroform, and I think they bear about this proportion. Syncope seems by far the worst accident, as you can do almost nothing,

while in asphyxia the patient has been brought about once or twice by artificial respiration alone ; as the pulse remains good the chloroform is got rid of by respiration.

Chloroform acts more safely on the young than the old, or, as it might perhaps be otherwise explained, in the old we have a smaller stock of irritability to work with, and once extinguished by chloroform it is not readily restored ; hence we have asphyxia. In the old, too, there are many more chances of old organic disease, such as a tendency to epilepsy, heart disease, *ramolissement* of the brain, &c. In the young the chloroform is quickly absorbed, there is very little plunging of the patient or excitement of the muscular system, and anæsthesia is quickly induced ; speaking generally, there have been no deaths of children from chloroform, though we see them in dozens, and of all ages, brought under its action. It does not seem probable, either, that in midwifery practice the mother ever suffers, or the child is ever killed by chloroform exhibited to the mother ; the fœtus is already beginning an independant state of existence from the first disturbance of the placenta, and previously from its mere passive vegetative life, the sensibility of the spinal nerves must have been very much in abeyance.

As to deaths from chloroform, I believe they are still very often due to inexperience of chloroform, and want of knowledge on the part of the administrator, and very often on mental emotion. It is the wildest fancy to think that as suggested by some ardent admirer of tubes and inhalers at St George's Hospital, that deaths occur from the use of folded lint, or sponges, or handker-

chiefs, in place of tubes and inhalers; some of the deaths are unmistakeably from overdoses: thus a patient, named Bennett, in 1849, died in Westminster; half an ounce was used without effect, and when two hours after some more chloroform was obtained he suddenly expired.*

* I do not like the idea sometimes of changing the chloroform one is using, and on no account ought persons to speak to or interrupt the surgeon while he is applying chloroform. I believe it is very necessary during inhalation of chloroform that the patient shall also very cautiously begin with what may be called a "maximum" dose of ʒiiss. or ʒi. , and then go on to smaller and smaller quantities of ʒss. , but never in the reverse order. Bernard has shown that in ordinary respiration of atmospheric air, if an animal is confined in a bell-glass, and at the end of an hour and a half it is still active, that such is the gradual adjustment of the animal's system to the new state of things, it will go on breathing; but if a fresh animal of the same kind be now introduced, it will die almost instantaneously, in consequence probably of the want of this adjustment. It seems pretty well established, too, that the poisonous influence of a vitiated air soon adjusts itself to the feeble, sickly organism, while a fresh perfectly healthy individual, going especially fasting early in the morning into a cholera district or a fever ward, though a nurse or other patients may escape, will be almost certain to suffer.

Experiments in animals, no doubt, are sometimes faulty. It is known that cold-blooded animals will breathe very wonderfully in pure hydrogen, which permits the exhalation of carbonic acid from the blood. I referred before to the ingenious experiments

The French Academy decided that the handkerchief had nothing to do with death from chloroform, and in London at the leading hospitals nothing else is used in about six out of ten of these institutions.

We know that æther will not cause those very sudden deaths by syncope, that chloroform is, perhaps, fairly chargeable with (I now speak more especially of experiments with these two agents respectively on the lower animals); it has been recently recommended accordingly to use a large admixture of æther with chloroform, and I think it is very advisable in the extremes of life in patients, viz., in infancy and old age. Æther, if swallowed in any large quantity in a fluid state, produces signs of intoxication with obtunded sensibility, the pulse remaining little affected; it might be useful as a preliminary, like the administration of wine or opium, and if we are to take the experience of Mr

of Dr Edward Smith, conducted along with Dr Snow, where the amount of carbonic acid given off from the blood is decreased under chloroform, but increased very much by the stimulus of starch or sugar in food. It may be that chloroform interferes with the exhalation of carbonic acid from the blood where used for a long time; but I am afraid the pretty theory of M. Ozanam, copied by a "Consulting Surgeon" recently in the 'Times,' is not at all true. Exercise and vegetable food increase the amount of carbonic acid given off from the lungs, so that it may be well never to give chloroform after a patient, exhausted after a long walk, as in the woman at Epsom recently, or after a meal; this patient at Epsom also had spts. ammoniæ and water poured into the throat—a thing which, I believe, never does good.

Hayward of Boston, and M. Quadri of Naples (both of whom have afforded me recently every information possible on the subject of æther as an anæsthetic), as fair exponents of the safety of æther, it certainly deserves to be used much oftener than at present! Deaths from chloroform I think occur in two distinct and different ways—one by syncope and to be combated as syncope, the other by drowning or asphyxia, the patient is drowned in vapour of chloroform.

I am very unwilling to say much of death from chloroform, more than has been already suggested by the points already dwelt on, such as the contraindications to chloroform, the danger of the early stage, the law of tolerance of Professor Miller, the dangers of impure chloroform, &c. ; it would be easy to head a chapter “Mors in Olla,” and go with my friend Dr Ramsbotham over the matter, but I fear it would be of very little practical utility. Let us all strive to prevent deaths from chloroform by better and cheaper medical education in our medical schools under the new medical reform so long wanted ; let us have every little suggestion to save life garnered up as a treasure.

Although it may not be desirable to withhold all kinds of food from a patient before operating under chloroform, as the patient may have beef-tea, wine, &c., as usual it is distinctly to be prohibited that very solid food should be taken. I think for two reasons quite different from those usually made, that the emotional turmoil in the patient's mind previous to operation suspends digestion, the other that this mechanical load of a now passive and heavy stomach presses on the aorta, semilunar ganglia, dia-

phragm, &c., adding to the hideous Queen Mab nightmare of the operation.

Then as to the mental emotion that it disturbs digestion, as it disturbs sleep as referred to before, has not escaped the true and delicate observation of Shakespeare, where every one remembers the double-dealing Wolsey returned his double-dealing letter by Henry VIII, when the latter is about to dismiss him—"Read o'er this," says the King—and after this (his dismissal)—

"And then to breakfast, with
What appetite you have."

In this one line we have the voluptuous and unfeeling King, and all the tale of poor Catherine of Arragon in a nutshell, but most chiefly have we Shakespeare's most true observation of emotion as destroying digestion.*

* I may take this opportunity of saying that it has been solely with the object of explaining to the general reader what we mean by the effect of emotion and mental depression in the body that I have more than once referred to Shakespeare. In estimating the value of the philosophy of this great poet, we should compare it with the feeble and disappointing fancies of the 'Novum Organon'—a most overrated work, where one walks through the dusty paths of science with peas in his shoes. Bacon's style, and his 'Moral Essays,' are the finest things in the language; but he is sometimes very violent. Thus Shakespeare speaks of Galen and Paracelsus in 'All's Well that Ends Well,' as those "learned and authentic fellows." But let us hear Bacon on Paracelsus, whom he hated but copied, and on Galen, whose experiments on the spinal cord Sir C. Bell and

It is very advantageous that the patient should have a thorough confidence in whoever administers ehloroform; we referred before (page 23) to the case of Russian prisoners at Sebastopol requiring a double amount of ehloroform to quell the emotional alarm in their mind. This emotion will destroy appetite for food; it will impede labour pains in obstetric practice; it will set the heart beating; it will destroy sleep, as already referred to by the poet Young. The "shock" of emotion is primarily on the sympathetic system, and we must remember that the broad distinction between the symmetrical and the unsymmetrical or sympathetic system is that in the former, where we have two symmetrical halves, one part may assist the other, one arm or leg or eye may assist the other, but a shock to the unsymmetrical organ is fatal; one symmetrical half may take rest or sleep while the other is active.

In hospitals I most fully believe we should imitate or be subservient to Nature, and if we do we shall have very few deaths from chloroform. If I have mentioned that I have seen about 11,000 adminis-

Brown-Séguard have admired. "Galen," says Bacon, "is an idle caviller, a man of very narrow mind; while Paracelsus, for his insolence, deserves to be separately chastised as a monster blinder than fate and more rash than chance." Hippocrates is a "creature patched up of antiquity, and the designs of Celsus are not so faulty as they are useless." It is quite clear that we must not go to Bacon, then, for any ideas on the nervous system odoraments or suffumigations, whereas Shakespeare is quite full of what Lucentio calls "the sweets of sweet philosophy."

trations of chloroform, it is partly for the purpose of adding that I have witnessed only two deaths in all that number. I may say I attended the post-mortem examination in four cases; all had healthy hearts, but none were cases in my own practice. We should imitate Nature, and administer the chloroform in a quiet, somewhat-darkened apartment, away from the knives and saws and the "fierce vexation" of an operating theatre filled with strangers. Patients have been kept so long as an hour and a quarter fully under chloroform, their existence balanced between life and death, but one occasionally sees some patients, females especially, ready to drop dead with alarm, bashfulness, and mental emotion, not easy to analyse, but all which interferes with chloroform inhalation. I will only say, in conclusion, that I think death from chloroform is not a casualty depending so much on the proper administration of that agent as an accident which may become almost or entirely unknown in a few years.

FINIS.

APPENDIX,
OR
PRACTICAL SUMMARY
OF ANÆSTHETICS.

“ Multum egerunt, qui ante nos fuerunt, sed non peregerunt; multum adhuc restat operis, multumque restabit, nec ulli nato post mille sæcula præcluditur occasio aliquid adhuc adjiciendi.”—SENECA.

APPENDIX.

IT may be objected that I have dwelt too much on the purely psychical aspect of anæsthetics, or the nature of nervous emotion and " shock " of operations as we see them every day in hospital practice, that I have drawn too broad a line of distinction between experiments on frogs, lizards, birds, &c., with chloroform, acetone, æther, amylene, &c., and the administration of such agents in the case of sick and emotional men and women. I am satisfied, however, that by experiments on animals we have only part of the truth, and a very small part, but that the more we watch year after year in hospital practice, the closer shall we get to the true causes of danger from chloroform, and that these are probably not what has been hitherto suspected, and copied from one writer to another.

It is curious that the points given up by all the best observers in the London hospitals and in Paris, as quite untenable, are again and again adopted by

the unreflecting portion of the Profession.* There is no error that has taken a deeper root than that one which represents death as the result of very prolonged coma or anæsthesia; still one sees dozens of patients, one after another, in such operations as those for vesico-vaginal fistula, resection of the knee, or necrosed bone—ay, a hundred such cases or amputations in as many days, averaging each an hour's deep coma and insensibility, yet nothing comes of it; but lo! a whitlow is to be opened under chloroform, or a tooth extracted, or a child operated on—as the other day for squint—and before the chloroform has acted at all, there is a sudden spasm, emotion, convulsion, and death.

But how can emotion or nervous sympathy of

* Mr Coates, of Salisbury, adopting a form of inhaler in use at Guy's Hospital, furnished with a silver funnel, finds fifteen minims of chloroform every minute the safest and most effectual dose; and six doses, or about $1\frac{1}{2}$ drachms as usually known, in eight or ten minutes induces perfect anæsthesia. There is nothing new in this. The journals have sung, it is true, a pœan of wonder at the discovery that fifteen minims is the most effectual dose; yet out of twenty-five cases of death in the 'Association Journal,' about one-half took place in less than two minutes,—and in forty deaths that I referred to, and since given by Dr Snow, in thirty-six the death occurred *long before insensibility was induced by the chloroform*—so that Mr Coates cannot be right. "Apnea," a new word for asphyxia, is not the most frequent cause of death in hospital patients, though it may be in small animals under glass bells.

this kind lead to a fatal result? Now, it is very remarkable to find M. Brown-Séquard describing certain peripheral sensations, which are taken up at specific points, which do not form ordinary ideas in the mind, but induce epileptic seizures. Dr A. Farre believes in "emotion" as a disturbing but not a directing cause in cases of tedious labour under chloroform. We know really very little of the nervous complication known under the term hysteria; while Dr Todd, speaking of the disease "Chorea," says, "If I were to refer to any particular part of the brain as more especially the seat of this disease, it would be that which may be regarded as the centre of emotion. The chain of phenomena would be as follows: first, a peculiar diathesis; then enfeebled nutrition; thirdly, any strong mental impression which disturbs the centre of emotion, and more or less of the general nervous system." Yet why in accidents from chloroform do we deny the existence of "emotion," though this is exactly the part of the brain affected by it!

I have mentioned, that amongst the French prisoners carried wounded to the hospital of M. Pirogoff in the Crimea, it was found that, from the emotion of fear, they required twice as much chloroform as the ordinary Russian soldier when he was wounded. We have had an analogous fact recently stated by the surgeons who were present at the frightful scenes of the siege of Lucknow, that while the chloroform lasted all went well, but when it became exhausted, especially amongst some of the poor fellows of Havelock's relieving force, who required amputations, the rate of mortality was very much greater from what they very properly style (in op-

position to Mr Cole) the "shock" of the operations as increased by the absence of chloroform—the nervous alarm or emotion of an operation without chloroform.

I referred (page 99) to TWO THOUSAND cases of labour in the maternity department of our London hospitals and elsewhere, all attended under chloroform or æther, and without a single accident ascribable to the anæsthetic. The labour in such cases is not impeded by emotion when chloroform is used in cautious doses; nay, Dr Murphy, from his experience of recent years, believes that the labour goes on better than in similar cases without chloroform—and why? Because, as he says, the power of impeding labour possessed by emotion is removed out of the way when the patient is in a state of agreeable dreamy unconsciousness from chloroform; nay more, that the relief of pain, and lessening of the "shock" or emotion, enables the patient to "resist those causes of fever and inflammation which interfere with recovery." Dr A. Farre therefore does not get over the difficulty in striving to solve it; he merely exchanges one set of phrases for another.

I believe this simple fact—stated by the surgeons in Lueknow in their late report to the Medical department of Leadenhall street—is worth volumes of London Hospital statistics, made to prove anything at all that one wishes them to do; whereas the effect of chloroform on the statistical result of a large number of amputations, lithotomy operations, resections, &c., may and must be much less than the effect of the prevailing weather or wind at the period of each operation, the supporting or non-supporting plan of after treatment adopted by the surgeon in charge

of each case, and a multiplicity of other things that it would puzzle my friend M. Quetelet of Brussels (rather a proficient at such statistics) to bring into any kind of correlation with hospital statistics.

We must remember, in a word, that emotion acts with a double edge. If from unskilfulness in the administration of anæsthetics and bad hospital arrangements that process is surrounded with terror and dread—if deaths from chloroform, especially in midwifery practice, be exaggerated in journals and overstated, and if to this chapter of horrors be added a want of faith in the “law of tolerance” of chloroform by the system under serious and distressing disease, and that we choose our patients badly that may or may not have chloroform, &c. &c.—then it is most likely that we shall find evil to arise to the patient from the emotion of fear and nervous depression, which the patient cannot control; whereas, if we reverse this picture, and if none of the ordinary causes of increased mortality in hospitals, such as pyæmia, erysipelas, purgatives (still given after hernia operations), errors in lithotomy, lowering treatment in hospitals, &c., come to complicate things—then most assuredly the emotion of joy or hope gilds with its golden beams the prospect of the poor patient who looks forward to a surgical operation with chloroform. I have accordingly avoided, rather than multiplied, experiments and observations on the lower animals with chloroform, as such experiments are separated, I believe, by a deep gulf from the very dissimilar trials and ever varying use of chloroform in hospitals. We may kill a dozen rabbits or guinea pigs with our doses of chloroform, but that does not

shed any light on the obscure and perhaps illusory subject mooted especially by Dr Arnott, whether chloroform in proper doses leads to an increased mortality in hospitals, comparing the statistics of surgical operations twenty years ago with present statistics of a like kind. We may take out the heart of a frog and stop its action by dropping chloroform on it, but that does not satisfy one that chorea, delirium tremens, spasm of the glottis, or such a poetie abstraction as mental emotion or nervousness in very nervous patients, may not also prove fatal. Experiments on frogs will not assure us when, in the human subject in the operating room, we should administer chloroform *quickly*, or when it should be given *slowly*; yet from what is now seen in practice, it is (page 28) decided to give chloroform quickly—viz., in an interval of about four minutes, and in large doses, where the operation, as in cataract or lithotomy, is rapidly or quickly done, and it is advisable to avoid vomiting, which seldom or never occurs in deep anæsthesia (children also will bear anæsthesia quickly induced), whereas in all slow operations, in midwifery or in operations like amputation of the thigh or resection of the knee, attended with apprehension of much hæmorrhage, this period of four minutes may be safely trebled, and the anæsthesia, even with the inconvenience of vomiting, may be restrained to the second stage with advantage. I saw chloroform administered ten years ago in Paris by M. Roux, M. Jobert, and others, without rule or compass, so to speak; but I now perceive the great value of the stages of chloroform anæsthesia, that it has taken us seven years more to eliminate. By watching patients

on the operating table, I have detected a very delicate test of the difference between the second and third stage of chloroform anæsthesia; it is in opposition to the popular idea which originated with Sir C. Bell, that the eye turns up in deep sleep. It is in this third stage, however, not turned up, but rather "directed forwards, and seems suspended in the orbit, being equipoised amongst its muscles." If the orbicularis muscle, however, or the palpebræ retain the contractility or irritability of the second stage of chloroform anæsthesia, the eye-ball instantly turns upwards and inwards, on being touched or irritated. In sound tranquil sleep the eye-ball does not go up, but if the sleep be disturbed or the emotions active, as in dreaming, attended with wrinkles of the eye-lids, then the reflex system is still active and the eye will go up.

Who shall say that we ought to neglect the study of sympathies and emotions? even the appearance of the eye of a patient on the operating table may reveal a world of nervous disturbance and mental excitement that nothing else can or will. Poetry has been defined, by Bacon, an art "intended for exciting and describing the emotions;" and the fancy of "Queen Mab" (page 102) is but the correlative of the fact stated by M. Brown-Séquard, that the same external impressions re-act on the brain proper and spinal system in several different forms; nay, that death itself under chloroform is due in some persons of nervous temperament to the impression of chloroform vapour in the lung on the par vagum conveyed by one of these peculiar sympathies to the

heart. Acetone or amylene is not so specific in this action, judging from experiments on animals.

Do diseases of the lungs and heart forbid the administration of chloroform? This question has been the cause of much contention. Hear how Dr Snow answers it. In the first place we must premise that Dr Snow insists upon a due dilution of the anæsthetic by atmospheric air; and to secure this result insists also on the use of his inhaler.

“Affections of the lungs sometimes cause a little difficulty and delay in the administration of chloroform, as the vapour is liable to excite coughing when the mucous membrane of the air passages is irritable. The inconvenience is, however, confined to the time of inhalation, for the cough is generally relieved afterwards.

“I have given chloroform for surgical operations in many cases where phthisis was present, and in several patients who had suffered from hæmoptysis, and have not seen any ill effects from its use in these cases. Chloroform has indeed often been inhaled with advantage to relieve the cough in consumption. The cases of chronic bronchitis in which chloroform is administered for surgical operations are still more numerous. The effects I have observed have been coughing at the time of inhalation, and very often a relief of the cough afterwards. Some of the patients had emphysema of the lungs. It is scarcely necessary to allude, in this place, to acute diseases of the lungs, as surgical operations are not performed during their continuance, but from the fact of chloroform being inhaled occasionally in the treatment of these affections, it is evident that they would cause no obstacle to its employment.

“*Disease of the Heart.* There is a very general impression that the use of chloroform is unsafe when disease of the heart exists, more particularly fatty degeneration of that organ. This belief has been encouraged by the circumstance that this affection

has been present in a few of both the real and alleged deaths from chloroform; and also by the fact that, in the accidents that have been really due to chloroform, the heart has been the organ on which it has exerted its fatal influence. When we come to investigate these cases, however, we shall find reason to conclude that the heart has probably been diseased in quite as great a proportion of the patients who have taken chloroform without ill effects, as in those who have succumbed under its influence. As regards my own practice, indeed, the only case in which death could in any degree be attributed to the chloroform, was one in which there was extreme fatty degeneration of the heart; but on the other hand, I have given chloroform in numerous cases without ill effects where the symptoms of this, as well as other affections of the heart, were present in a very marked degree. Indeed, I have never declined to give chloroform to a patient requiring a surgical operation, whatever might be his condition, as I early arrived at the conclusion that this agent, when carefully administered, causes less disturbance of the heart and circulation than does severe pain. Whenever I have had an opportunity of seeing an operation performed without chloroform, I have carefully observed the pulse, and although none of these operations have been of a very severe nature, I have found the circulation to be much more disturbed than it would have been by chloroform carefully administered. The pulse in most of these cases has been excessively frequent during the operation, and in some instances it has intermitted to an unusual extent."

With respect to the mode in which death occurs under chloroform, Dr Snow says:

"In all the cases in which the symptoms which occurred at the time of death are reported, there is every reason to conclude, as shown above, that death took place by cardiac syncope, or arrest of the action of the heart. In forty of these cases the symptoms of danger appeared to arise entirely from cardiac syncope, and were not complicated by the

over-action of the chloroform on the brain. It was only in four cases that the breathing appeared to be embarrassed and arrested by the effect of the chloroform on the brain and medulla oblongata, at the time when the action of the heart was arrested by it; and only in one of these cases (No. 42) that the breathing was distinctly arrested by the effect of the chloroform, a few seconds before that agent also arrested the action of the heart.

“It was previously shown that chloroform vapour has the effect of suddenly arresting the action of the heart when it is mixed with the respired air to the extent of eight or ten per cent., or upwards; and we must therefore conclude that, in the fatal cases of its inhalation, the air the patients were breathing just before the accidents occurred contained this amount of vapour. There was no means adopted, so far as is reported, to regulate the proportion of vapour in the inspired air, in any case in which an accident happened; and there was the liability in every case that ten per cent. or more of vapour might be present in the air the patient breathed; and in no case did death occur in the manner that it occurs when the vapour of chloroform does not exceed five per cent. of the inspired air.”

The purely surgical cases I shall not revert to, but recite what Dr Snow says about chloroform in midwifery:

“It is probable that the use of chloroform has no particular influence over the duration of labour, in the whole number of cases in which it is employed; but individual labours are occasionally either retarded or quickened by it, according to circumstances. In some cases, the chloroform, even when very moderately employed, diminishes both the strength and the duration of the uterine contractions, and prolongs the interval between them, thereby making the labour somewhat longer—a matter of no consequence, however, as the patient is not suffering in any way. In other cases, the inhalation causes the uterine action to become stronger

and more regular, by removing the excess of sensibility by which it has been interfered with. This occurs more particularly in the first stage of labour. In some cases, also, the chloroform seems to act as a direct stimulant to the uterine contractions, increasing their force and frequency—a circumstance at which we need not be surprised, when we remember that both opium and brandy, in moderate quantity, often act in the same manner. Chloroform has also the effect of promoting the dilatation of the os uteri in many cases, even when no rigidity exists; and when there is rigidity of the os uteri, the inhalation is of the utmost service, and shortens labour very much. This is the case, also, when there is rigidity of the perinæum.”

CARDIAC SYNCOPE.

A death from chloroform, which has taken place in Paris this year (1859), illustrates in the most perfect manner what I have previously attempted to describe: death not gradually from apnea or asphyxia from large doses of chloroform, but death from sudden “shock” or disturbance of some diseased link in the broken chain of emotional action, by ordinary or even small doses of that agent.

All I contend for is, that, previously to chloroform acting on the respiration, and the respiratory tract, for which so many modifications of inhalers are thought by mere theorists to be entirely specific, there is, in about half the entire number of cases, a certain implication of the parts of the brain proper connected with emotion, as shown in chorea, hysteria, &c., which has been overlooked. The action of the heart in this case in Paris was stopped by a sudden nervous shock or emotion, but the respiration went on as before. The French Surgeon calls it death by “sideration,” a favourite term in Paris when some occult

or purely psychical action—as an influence of adverse stars on the processes of life and consciousness, as in old times of astrology—is sought to be conveyed (we have the analogous term of lunacy from the influence of the moon). “Sideration,” of course, explains very little; if it mean anything at all, it is, that the patient dies from no pathological complication like fatty heart, but from emotion, or purely psychical prostration from nervous depression.

In one form of hysteria it has been only recently noticed, that there is complete anaesthesia of the skin during the fits; in such patients, the hysteric “fit” would most probably be excited as the patient is passing through the second stage of the chloroform process, but our means of restoring animation in such a hysteric case, such as cold dashing of water in case of impending danger, is of no avail. Dr Snow has done good work by showing that death is caused or completed by cardiac syncope, but I very much fear that the mischief is already completed before it comes to that, and that we must go deeper into the question.

What I am inclined to believe, as now established, is this, that mental emotion of one kind or another, as we know it may stop the action of the heart, through impressions made on the ganglionic system, may also render the heart at the moment of the second stage of chloroform more liable to be seized by what Dr Snow calls “cardiac syncope,” at least in hysteric and susceptible patients, though in experiments on the lower animals such emotions are absent. I cannot reconcile with death from a few drops of chloroform, the fact of another patient taking

seventeen ounces of chloroform, and being all the better for it, *quoad* the anæsthesia, or hundreds of patients remaining without accident an hour each on an average in deep coma, caused by several ounces of chloroform, the generally received doctrine being, that the deaths from chloroform have been ALL from overdosing. I have administered chloroform to nervous patients, and have detected early, certain signs in some that I am sure, if I pushed the anæsthetic ever so little farther, fatal syncope would have followed; while in other patients, not to be distinguished from the former, it has struck me that they would bear ever so large quantities of chloroform with perfect impunity! We know that in concussion of the brain, or the "shock" of a burn, the action of the heart is depressed or weakened in the same manner; nay, we have vomiting not unlike that of the vomiting of chloroform administration, probably from the same cause, whatever that is. It cannot of course be held, for a moment, that a patient or a healthy man may not die from inhaling the vapour of chloroform in too undiluted a state: all that seems to be decided is, that this is probably seldom if ever the form in which death takes place in hospital practice, and fortunately so, as we are every day obliged to push the chloroform to complete stertor. The vomiting under chloroform, as I said before, belongs to the same class of phenomena as the spasmodic turning up of the eyeball, or other excitomotor actions of the second stage; the vomiting occurs as the patient is relapsing into the second stage, out of the third or that of deep stertor.

As regards death from chloroform in hospitals,

and its most frequent cause, I cannot help thinking, in point of fact, that we still overlook the existence of "nervous diseases," or disorders, not of the heart, but of the central nervous masses, or, more correctly, disorder of these masses, together with diseased association with the web-work of peripheral nerves all over the frame (page 23.) I have been able to trace the previous history of only four deaths during the last couple of years since Dr Snow's book was written, and what do I find? That in two patients there were active symptoms of delirium tremens present; in a third the patient had had active meningitis, during which he was comatose for nearly a week, and was remarkable for stupidity of manner; in the fourth patient, more recently still, the lady had previously suffered from chorea and hysteric fits. It is quite clear that in such cases we are operating on an imperfect brain and cord, and when danger occurs we find ourselves quite at sea in our means of dealing with it.

I showed before that of forty deaths not less than thirty-six took place, not in the last stage, when we should expect coma or "cardiac syncope," but in the preliminary stage of epileptiform or hysteric convulsion. Death occurs, not so much from an overdose as from the fact that an imperfect brain does not answer to our stimulants. In nineteen deaths out of forty-five Dr Snow admits there were symptoms of over-narcotism of the brain; in thirteen of these cases, in fact, it was most marked; in forty he believed the death was from "cardiac syncope."

ASPHYXIA.

It is pretty well established that in asphyxia of

animals in a limited quantity of air, there is a larger amount of oxygen taken out of this air than of carbonic acid returned to it! Respiration, chemically regarded, is perhaps rather an act of simple endosmosis than anything exactly similar to combustion. No doubt if from any cause during chloroform inhalation an undue amount of carbon remains in the blood, and there be absence of air or of oxygen, we may have asphyxia. Thus it was observed everywhere in the Crimea that the soldiers put under chloroform in the open air on the field of battle bore the anæsthetic remarkably well, and deaths from chloroform were unknown in that trying campaign, where the French alone used it not less than 30,000 times! Why or how asphyxia kills, is still a matter of opinion, that of Bichât being perhaps the best; but Claude Bernard also finds that during asphyxia the functions of the liver, kidney, and stomach are at once arrested or changed. The system is suddenly pervaded by blood, not hæmated, and the heart suffers as an ordinary muscle would suffer. That chloroform, as now used in hospitals, is often carried to a very great extent, involving a condition not far from this, is very evident from the fact that *surgeons now, quite as a common rule, wait till the respiration has become slightly stertorous before they begin their operation*; surgeons quite commonly and quite safely are now guided by their ears as to the progress the anæsthesia may be making. The blood remains in a state of immobility in asphyxia, a condition which Mr Paget believed existed in one of the cases of death from chloroform which he saw; the right ventricle of the heart continues to beat longer than the left in

asphyxia ;—hence the blood collects in the lungs. Even by turning an animal upside down, when it is apparently dead from asphyxia, the blood may be set going again for a short time ; hence the rationale of rubbing the limbs in the direction of the venous current, where the patient is in a state of impending death from chloroform ; hence, perhaps, some of the value of the excellent Marshall Hall's rotations and manipulations.

Mr Sedillot says that pure chloroform properly used will never kill, and M. Denonvilliers lays great stress on calming the patient's mind as he is about to take chloroform ; this lessens emotional alarm.

The views of Brown-Séquard relative to the cause of death from chloroform, and his opinions arrived at from experiments with chloroform on animals, are also of the very first importance ; he has shown, amongst various experiments as to the transmission of sympathies or emotions (thus from one diseased eye to the opposite healthy eye, as seen often in practice, where extirpation of the diseased eye has done good), that death from chloroform is caused by the *sudden* impression of a large dose of chloroform in vapour in the lung on the ultimate fibres of the par-vagus in the lung conveyed by reflex action to the heart, weak at some point, paralysing that organ by sympathy.* If this be true in any number of cases, we have only to prepare our patient beforehand by a stimulant or perhaps give a dose of opium, or administer chloroform in a warm theatre, &c. &c.

* We know that the cardiac nerves come chiefly from the pneumo-gastric in the lower part of the neck, and communicate with branches of the "sympathetic."

We are called upon, also, to be particularly careful of patients where the machinery, so to speak, of the reflex and complex commissural processes is "out of gear," as in all patients where there have been "fits" of any kind, chorea, epilepsy or delirium tremens, &c. &c.

In speaking of some deaths from chloroform a couple of years since, my impression at that time, from what I had seen in hospitals, was conveyed in the following words: That in about half the cases of death scattered through the journals—(since placed together by Dr Snow)—death occurred not by asphyxia, as held at St Bartholomew's Hospital by Dr Black, "but that by some association of the nerves in the lung (par-vagus) with some other vital part, life was interfered with, the silver cord loosed, and the whole system like a broken harp responded no more to external agencies."* This exactly agrees with the phenomena in the late case in Paris.

We must also not forget that the centre of emotion in the brain is nearly the same as what we before termed the Sensorium (page 10), but also includes the origin of the portio dura, sixth and ninth nerves, so intimately associated with the par-vagus.

The right ventricle of the heart continues to contract longer than the left in asphyxia. This is a fact of no little importance, and would suggest that there is a chance of restoring life under chloroform, even after all pulse has ceased at the wrist. It is probable that chloroform, differing in that particular from amylene, acetone, &c., is mechanically mixed, or conveyed by the blood, and that a very few addi-

* 'Dublin Medical Press.'

tional inspirations (even by artificial respiration) would suffice to get rid of it out of the blood.

In the case recently in Paris, in place of simply trying very ordinary measures for a half hour and then giving it up as hopeless, I would have gone on for three hours with hope of success.

OF A RIGHT METHOD IN THE STUDY OF
ANÆSTHETICS.

When I spoke recently (page 113) of the "feeble and disappointing fancies" of Bacon's *novum organon*, as bearing on the science of medicine, I wished simply to guard the student of anæsthetics from prevailing medical errors. Our "inductionists" have already decided on one law, viz., that all deaths under chloroform arise from fatty heart, but no conclusion could be more fallacious. Another law in process of statistical evolution seems to be that chloroform doubles the mortality of some surgical operations. This latter is not so groundless as the former law, but both are inductions of persons unaccustomed to chloroform in hospital practice. The use of pieces of simple lint in place of Snow's inhaler, as a certain cause of death by asphyxia, is another *bete noir*,—and so of many other things. If I seem to be occasionally a little too exacting or anxious as to these so-called laws by induction, it is because I know, as Mr Whewell has well observed, that a conception of the mind enters as an element into every induction; a word or a phrase like "fatty heart" is actually essential to every induction, and once you have got the word, as in the case of the word "phlogiston" in chemistry, "inflammation" in pathology, &c., though ever so

erroneous, and though it may lead to endless confusion and disaster, you cannot still get rid of it: *e.g.*, "the term inflammation," says Andral, "has become so very vague, its interpretation so arbitrary, that it has really lost its value; it is like an old coin now to be removed from circulation as it only causes error and confusion;" created in the infancy of science, it was "a word or phrase altogether metaphorical, in which parts appeared to burn or to be inflamed," and this burning process was to be stopped by bloodletting in large quantities!

The science of anæsthetics, though for years and years to come it ought to be purely and simply a science of deep and constant observation of chloroform, æther, amylene, acetone, &c., in hospital practice, begins already to be overrun with similar hasty generalisations. I quite agree, however, with Mr Mill that "a revolution is peaceably and progressively effecting itself in philosophy, especially that of the physiological sciences, the reverse of that to which Bacon has attached his name," and that the phenomena of anæsthetics, for instance, are so complex, the relations of the intricate mechanism of the brain and nervous system to chloroform continues to be such a labyrinth, that it is only by perpetually watching patients under the effect of chloroform, and not by learned generalisations, that we can arrive at any safe conclusion in anæsthetics. Mr Mill says that "if Newton had not been able to fall back upon the confused rules and half-matured observations of Kepler, to confirm his law of gravitation, that gravitation would now be unknown, or never have emerged from the state of an hypothesis." We shall have the drill-

serjeant of the Baeon school, as regards anæsthetics, in the next generation, but meanwhile we must be satisfied with simple observation in hospitals. We shall have no Newton in our time in the science of ehloroform inhalation ; we must be satisfied with observations, like the "law of tolerance" of Professor Miller, though ever so obscure or mixed up with extraneous matter.

EARLY HISTORY OF ANÆSTHETICS.

All the very early history of anæsthetics is more or less confused. I do not know that there is much to be gleaned in that field. The use of Indian hemp, *Cannabis Indica*, in form of vapour bath as an anæsthetic is described in Herodotus (Book IV. chap. 73). Dr Royle even thought that the 'Nepenthe' of Homer was composed of this drug. Sir Joseph Banks distinctly refers to its use also amongst the Seythians to annul the pain of amputations! I spoke already of Moa Tho, the Chinese Physician, who we are told performed many surgical operations in this manner! Happening to meet Sir W. O'Shaughnessy, one of the last times he was in this country, I was very much astonished at the account he gave of the extraordinary powers of this medicine, as used extensively in India. It is not at all impossible, in fact, that it would produce such a state of delirium eatalepsy, or insensibility in certain cases, that a limb might be taken off and the patient know nothing about it! An Indian Surgeon writes this year of eatalepsy produced by Indian hemp.*

* On April 5, 1857, a young Mussulman, about eighteen years of age, by occupation a barber, was brought to Hospital in a state of insensibility. On

The Ancients, in their mystical but beautiful Philosophy, could understand sleep only as the shadow of a great giant passing along, overshadowing the soul, in the same manner that they believed that the sun did not set, as we believe it, in the west, but that the sun, as another giant walking and rejoicing in his vitalising strength over the heavens,

inquiry I learnt that he was in the habit of smoking bhang, or gunjah, that he was quite well in the morning, and was seen by some of his friends smoking this drug; he was brought to the Hospital about 4 p.m. His symptoms on admission were as follows:—

Total insensibility; sensation completely in abeyance; no reflex action could be excited by tickling the soles of the feet, or by pinching the skin, nor did he feel the latter; eyes open and fixed vacantly, pupils of natural size and sensible to the stimulus of light; jaw fixed and immoveable, the mouth closed. The state of the limbs was peculiar, the arms could be flexed or extended easily; but in whatever position they were placed, they remained; thus, when stretched out in front of him, or when placed vertically above the head, they remained in that position till moved again; the same occurred on flexing the arms; when the head was bent on one side, or depressed with the chin on the chest, it rested in that position till moved again. The lower extremities, too, could be placed in any position, and remained so; the pulse and skin natural. The treatment at this time consisted in cold douches frequently repeated, blister to the trachea, sinapisms to the calves and soles, and enema of aloes with turpentine. Notwithstanding these remedies he continued in the same condition till April 8,

reclined at night, or slept in the arms of a beautiful Virgin—Endymion in the arms of Kalyke. Apollo in Homer is the God of Medicine, and tells of this giant death, that passes shadowing in the form of sleep over the soul. Apollo, by his fore-knowledge of sickness and death, however, as Mr Gladstone observes, changes sickness into health—"the iron hand

three days after admission, when my notes are: April 8th.—He has continued perfectly insensible up to this time; he now lies as it were asleep, breathing calmly, the eyeballs turned upwards; muscles of arms and legs quite relaxed; evinces very slight reflex action when the soles are pinched or tickled; he cannot be roused by the loudest calling, or by the roughest shaking. At 1 p.m. to-day, seven hours subsequently, I found him being led about by two of his friends; he was moaning incessantly, and with difficulty prevented from putting his hands in his mouth, apparently for the purpose of biting them; he is now continually opening and shutting his mouth. Blisters were now applied to the calves, and the enemata repeated. Two days subsequently there were evidences of returning consciousness; he could be roused by calling to him in a very loud tone of voice, when he turned towards the speaker, and then relapsed again into the same condition, and walked to and fro moaning continually. Next day consciousness was regained, but he had lost all recollection of everything which had occurred from the morning of the day on which he was brought to the Hospital. This case affords a very interesting illustration of the effects of the Indian hemp in a large dose, and presents also a very striking resemblance to the description given by O'Shaughnessy.

of death, for a thread of silken slumber." Socrates did not hold the same terrible idea of death that we do in the present day, and all his school looked upon it as a passage to a happier life, of which still sleep is a shadow! With these ideas extant, it would be idle to look for a history of anæsthetics before the Christian era.

I have mentioned already (page 4) the curious anodyne or anæsthetic used by Theodoric in the twelfth century, referred to in 1538. I perceive that since then Dr Watson, in a note to the last edition of his 'Practice of Physic,' and Dr Snow, in his work since published, had also found it. Dr Watson gives references, *in extenso*, furnished him by the Librarian of the British Museum, to "*un soporifero che per mezzo del solo odorato assopiva i malati in occasione di operazione dolorose.*"

The early history of anæsthetics, which has a certain kind of attraction for some minds, is to be found in such works or the writings of the authors in the quaint period of the alchemists. In place of going over the story of Professor Simpson and the Liverpool chemist, or the hapless tale of the Connecticut dentist Morton (page 63), I have accordingly gone to Shakespeare, Bacon, Burton, &c. There can be very little doubt, in fact, where Middleton, in the sixteenth century, refers to the "pities of old surgeons,"

"who, ere they show their art

Cast one asleep, then cut the diseased part,"
that he was making reference to some potion or "drowsy syrup," familiar to the public mind, or to these old processes of Theodoric. I do not pretend to know more about Shakespeare and Bacon than

the generality of medical readers, but the allusions to anæsthetics in that century everywhere have often appeared to me as most remarkable, as indeed they also struck Dr Simpson.

The more recent history of anæsthetics is not one that may detain us very long. I do not know but that the story of the last ten or twelve years of anæsthetics is one of the most darksome in the whole romance of the history of medicine. We have fallen upon death-doing days, when to ravage and lay waste smiling gardens like those of Italy or the Crimea is considered something great; to kill men by millions is a virtue and a delight; but to save human life—to remove pain in tens of thousands of surgical operations, is to deserve to die in poverty and neglect, like Morton and poor Horace Wells! It is very wonderful to observe the latent germ of modern anæsthetics—like the fructifying principle lying dormant in a grain of wheat in the hand of an Egyptian mummy—in the chapter of Sir Humphry Davy's book on nitrous oxide, and a forgotten paper of Mr Faraday's on æther: but there it remained, while our medical schools at this side of the Atlantic merely admired and observed the outer ceremonies of the dead and forgotten volumes of Davy in medical libraries; and when, at length, chloroform came amongst us, it was said to be at law a misdemeanour to render patients in childbirth "drunk and incapable" by anæsthetics!

Next in importance to the researches of Morton and Horace Wells, but before them in point of time, are those observations of Sir Humphry Davy:—"The inhalation of nitrous oxide relieves from the pain of the head following intoxication," he says,

and so much was Sir Humphry struck with the anæsthesia induced under other circumstances, that he goes on to remark, "It (nitrous oxide) may possibly be used with advantage during surgical operations, in which no great effusion of blood takes place." Coleridge and Southey, his private friends, tried the experiments with him, and one lady was so inquisitive as to inhale four quarts of the nitrous oxide, presenting phenomena almost exactly like those that we are accustomed to under chloroform vapour! Horace Wells, forty-four years after, extracted the first tooth under anæsthetics. Dr Warren and Dr Hayward then suggested it, very naturally, for amputations; and in one patient a diseased mammary gland was removed without pain—the poor woman having inspired sixty quarts of nitrous oxide during the process; this quantity, we are told, was inspired in about six minutes. And though it may destroy the modern theory (which, by the way, I have never thought true), that the active principle of all our anæsthetics is carbon, these sixty quarts of nitrous oxide produced most tranquil and complete insensibility. Poor Wells seems to have died of disappointment—one other martyr to science, he was so persecuted for his "new fangles." Morton, his pupil, still adhered to the subject; and though he made a discovery of practical value and importance, which to my mind is equal to the discovery of vaccination by Jenner (for many persons doubt the value of vaccination), Morton shared the same fate of misery and disaster as Wells! The discovery was made in this wise—and so of CHLOROFORM. Probably aware of the somewhat analogous effects of "laughing gas" and æther (an

old idea in America, according to my friend Dr Hayward), Morton tried æther in place of the nitrous oxide!

OF THE FOUR STAGES OF CHLOROFORM
ANÆSTHESIA.

The second half of the previous treatise on Æther and Chloroform was dedicated to chloroform and its early history, as the first portion was taken up chiefly by a comparison of the value of chloroform and æther as anæsthetics, the modes of applying æther as practised in Italy, Austria, America, &c. &c. The key that unlocked this new and unexpected world of magic, from which pain was banished, was shown to be undoubtedly the happy experiment of the dentist in Connecticut (page 63), that of substituting the vapour of æther for the difficultly-obtained nitrous oxide gas. The name of Morton may stand fairly alongside that of Jenner, while the happy substitution of chloroform, amylene, &c., for æther, may be classed amongst the natural results of our modern deductive philosophy.

FIRST STAGE.

Practical men in the hospital theatre begin to be every year more and more certain of the actual existence, and more familiar with well-marked phenomena of four stages or degrees in the action of chloroform; these stages no doubt follow one another very quickly, or merge one into the other like the colours in the prism; they are the refractions, so to speak, of simple consciousness or cerebro-spinal action produced by the disturbing medium, chloroform. The "*First Stage*" is quickly passed over, and is described as a matter of convenience rather than practical value, as all that portion of the excite-

ment or disturbance of the system, early manifested under chloroform, which is observed previous to the convulsive contraction of the muscles of the limbs soon sets in, and marks the second stage; the former stage being one of cerebral, the latter of spinal excitement. The symmetrical organs of the body, so different from the unsymmetrical as dwelt on by Bichât, are those which are first affected by chloroform, and in a very marked degree. In the first stage, the sensations are agreeable, not unlike those experienced in inhaling nitrous oxide gas: patients usually display some alarm or emotion on account of the surgical operation they are about to submit to, and palpitation of the heart or dizziness of the head is complained of; there may be also tingling of the limbs. Some have compared this first stage to the feeling experienced on entering a railway tunnel, as vision also becomes imperfect. In the first stage, as said before, simple consciousness is disturbed, or it may be retained, though imperfectly, while sensation of pain is diminished; thus, in midwifery practice, the patient speaks with joy that she knows there is a pain present, but her sensation of pain or suffering is absent; one often hears, also, a patient saying that, when slightly under chloroform, he has heard the saw at work sawing the bone in an amputation of the foot, but experienced no pain whatever; in dentistry, where the fifth nerve, the most sensitive of all the nerves, is engaged, this condition of things is not to be expected, and there the first is merged of necessity in the second and third stages.

SECOND STAGE.

In the "*Second Stage*," marked often by the

plunging of the patient, suffusion of the face, and epileptical or convulsive action of all parts endowed with muscles, the consciousness is destroyed or disturbed, the patient still talks, the muscles of his limbs are like iron, he bends forwards involuntarily in the manner of *emprostotonos*, and is with difficulty retained on the operating-table. This stage, and this stage alone, presents the man as if violently intoxicated; this stage I believe, though Dr Snow did not detect the fact, is by very much and by far the most dangerous of all the four stages. I have said that all the parts endowed with muscles—the legs, thighs, arms, abdomen, and, as well and acutely observed, even the parts in connexion with the small muscles of the pelvis and perinæum in lithotomy, for instance, are strongly contracted or cramped. I do not say that the heart is always in this condition, but I have on several occasions suspected that, in special cases where hysteric or epileptoid complications were present in the patient's system, though the surgeon was not aware of it, the heart was suddenly stopped by laryngismus or such muscular action. On this point, and some others, we want facts and good observers in hospital practice; men with good and clear ideas of the nervous system, and its various complications and relations.

It is in this second stage that a patient is occasionally observed to hold his breath convulsively, during which action we know that the right side of the heart is filled, almost to bursting, with venous blood; he then takes, what Dr Snow used to fear so much, a "tremendous gulp of air highly charged with chloroform," and as he is gliding into the third

stage, or that of immobility and deep anæsthesia, this gulp of almost pure chloroform vapour begins to tell on his system, and to aggravate matters very much; the pulse sinks; the administration of the chloroform is partly suspended for a while, and if vomiting now sets in, as it is most likely to do, the depression and tendency to "cardiac syncope" are more and more augmented.* This sudden "sideration," so to call it, begins, I believe, in many cases,

* I believe, as further corroborating these views of the danger of this "shock," that in natural sleep, where the mind, as Locke says, retires—where the perceptions accompanying impressions made on the body are absent, as the cerebrum proper is dormant; or explain it how we will, during common sleep, when the will is passive, that then ordinary breathing is carried on *solely* by the diaphragm, which becomes a sort of second heart. If out of a deep sleep one is calmly awoke by some low murmuring noise, it is easy to perceive an involuntary action of the diaphragm still going on that you cannot control without pain, followed by a deep inspiration, which seems to startle or wake up the external respiratory nerves! It seems to me also that this is a plain provision to afford rest during sleep to the *external* respiratory nerves and muscles. We have the same kind of slumber under chloroform of the external respiratory muscles.

I know of nothing more beautiful than the alternate action of the voluntary and involuntary muscles of respiration—the associated action of the *scaleni serratus* and *intercostals* in inspiration, so much under the influence of the will, and so soon anæsthetised under chloroform. And then the dia-

in a sobbing or spasm of the diaphragm, like the iron tension of the external respiratory muscles, and where and when it proves fatal it is owing to the fact that the last part of the nervous system to withstand the effect of chloroform is the *neud vitale* of Flourens; but once respiration or the respiratory tract connected with that part of the medulla is engaged, life becomes extinct.

Very much depends on the manner in which the chloroform is being administered, as well as on the development or non-development of the spinal and muscular system in each particular patient; if the chloroform be given in steady and pretty large quantities, the second stage is scarcely perceived at all, nor is it very observable in young patients of either sex, in whom there exists also a most remarkable immunity from danger under all kinds of anæsthetics.

I have seldom or never heard what has been

phragm, "*musculus nobillissimus post cor*," but like the heart, still keeping up its action, independent of the will and the *slighter* degrees of etherisation by chloroform.

The great problem was to be solved to continue respiration when sleep brought on its deep unconsciousness, and to leave respiration also voluntary for its uses in connexion with the spinal nerves and those of the human voice; the former is effected through the agency of reflex nerves and diaphragm; the brain proper is dormant; there is no association of ideas or reception of ideas in the mind;

"*Mens sine pondere ludit*,"

but still the ever wakeful diaphragm keeps all right through its phrenic nerve.

recently regretted and described as obscene talking in these two preliminary stages of etherisation by chloroform;—if one would take up any modern newspaper he could probably find amongst its advertisements and law intelligence more true filthiness than in all the operating theatres of London in a year. Incongruities no doubt, the most disjointed but harmless, charades, ineptitudes, and quaintnesses, out of the world of dreams the most ludicrous, follow one another with a curious infelicity on the operating table; the detailed history of some new chloroform nightmare is ever turning up, as if the poor patient were a City alderman or alderman's wife who had taken too much turtle, salmon, punch, and pine-apples; anything and everything is talked under chloroform,—nay, it is not impossible, I believe, by certain manipulations of the head, to direct the tenour of the dream, or talk, into any direction one may please; but for obscene talking I must say, in many thousand cases I have not noticed it in these stages. Patients under chloroform, however, in the second stage say very odd things, and sometimes sing various tunes, and with most marvellous accuracy. I heard a patient sing the entire of one of the long church canticles at St Bartholomew's, whilst his leg was being taken off. A poor woman at Guy's had a breast removed—she thanked one of the leading surgeons who did the operation: "It's a very nice operation—ah! dear Mr —," she said, very sentimentiously, "no pain, but dear Mr — has such a nice greengrocer's shop opposite our house; his potatoes are the best in our street, we deals always with him, he is so kind, he ain't no surgeon,—he's

a Christian, he is !” These laughable but common incidents are mentioned to show that any evidence in a court of justice a chloroform patient might give should be taken with very considerable caution and reserve.

THIRD STAGE.

The “*third stage*” under chloroform is so well known and so familiar to every professional reader, that it needs scarcely any description; it is, *par excellence*, what may be called the surgical or true anæsthetic stage of the etherisation process. The third stage is signalled by a sudden cessation of the previous violent plunging of the limbs and of the rigidity of the muscles just described; the pulse in this stage is generally soft and good, indeed more natural and even than in the previous stages. In children this third stage is marked by abrupt stoppage of the previous crying, and in them the most perfect and healthy calmness and want of feeling, like ordinary sleep, succeeds in an instant to the screaming and alarm evinced at the operation, when placed first on the operating table. In adults, the rambling and incoherence of the second stage only partially ceases, the eyelids droop and close, the patient—who half-a-minute before was saying, “Now take care I am entirely off before the cutting begins,”—is to all intents and purposes “entirely off;” there may be slight stertor, but I do not believe it is a thing to be afraid of.

“A soldier in the Crimea,” says M. Baudens, “was struck by a shell; a piece of iron weighing two kilogrammes (4lb.!) was completely buried in the muscles, having shattered the bone at the top of the thigh (*haut de la cuisse*); he was placed

well under ehloroform in the third stage, and slightly stertorous, we extracted the shell, and then amputated without the patient suffering in the least—he recovered!” but M. Baudens adds, “sans le chloroforme on aurait hésité a tenter l’operation;”—without chloroform, in fact, in the third stage, the man would have been left to die. Dr Snow mentions similar cases in the English army at the same time. In this third stage there is most complete absence of feeling, beginning in the inferior half of the body first, or that more immediately under the influence of the cauda equina, but almost immediately after engaging the corpora striata, optic thalami fifth, and associated nerves of the face, the sensibility of the conjunctival membrane of the eye is entirely lost,—the eyeball, as said before, no longer turns up, but seems equipoised amidst its muscles. The breathing of the patient continues calm and good in the third stage, as a general rule, but is occasionally laboured; the surgical operation, even of the most formidable kind, proceeds without the patient seeming to suffer pain in the slightest degree; nay, what is more extraordinary still, the sudden removal of a limb, such as amputation of the thigh or arm, or the laying open of a large cavity like the knee-joint in resction, appears almost totally without influence on the pulse or general progression of events of the anæsthetic process! I have known, many times, the pulse in cases of ovariectomy to be feeble and thready in the early stages, but suddenly to become quite soft, large, and re-assuring when the entire abdominal cavity was laid open.

I think the direction given in certain cases of very painful but short surgical operations, to

administer chloroform boldly but with steadiness, is a good one ; imperfect doses of a few drops, recommended by some, are the same as if one should use an imperfectly sharpened or blunt knife to prevent us cutting too much in lithotomy, cataract, or tenotomy ! The errors of consciousness after this third stage, as in the woman just mentioned operated on at Guy's, are very curious. Thus, a poor young man at St George's Hospital, not long since, would not believe his leg was amputated, and pulled out all the ligatures next day, as he did not see what business they had attached to his thigh ; he nearly died of secondary hæmorrhage and necrosis ! These and a hundred similar facts show how curiously simple consciousness is disturbed by chloroform in this third stage, where anæsthesia is complete and the connexion of the outer or exterior world in relation to feeling, consciousness, and thought destroyed even for a few minutes.

FOURTH STAGE.

Of the *fourth stage* under chloroform (collapsus of French surgeons), I take the following case, almost at random, from the French journals of this month :— A young woman, engaged in a factory, was operated on by M. Poizat for the extraction of needles from the mammary gland, that got implanted in it by some romping with other girls. The operation, though simple and without any hæmorrhage, became long and wearisome (*minutieuse*), as the patient said, previous to being placed under chloroform, that there were three needles in the gland, though but one made its appearance. “ We commenced the operation,” says this surgeon, “ by placing the patient under chloroform ; we dropped some chloroform (he

does not say how much, but as he specifies 150 drops as a moderate quantity in another operation, it is probable that the quantity was very considerable in this case also), five minutes passed, ten minutes, even a quarter of an hour, still the chloroform manifested no action; the pulse was unchanged; the patient talked hysterically, and said she felt nothing; pinched a little, she wished us not to torment her, she felt the pinching very sharply; finally, after employing inhalation, which lasted not much less than a half hour, a large bottle of chloroform having been wasted in the endeavour, I decided to operate without any more chloroform." The first needle was easily brought away, and in the extraction of the second the patient was desired to move her arm about so as to contract the pectoralis, &c., which she did accordingly, not being at all unconscious; two hours had passed from the commencement of the operation to the extraction of the last needle; the wound was then closed by strips of adhesive plaster. The young woman seemed very much pleased, and examined the three needles with much gratification, passing them back and forward from one hand to the other. A quarter of an hour was sufficient to adjust the patient's dress, and she was permitted to be taken away, as she seemed perfectly well. The case, in fact, except for this singular resistance to chloroform, offered nothing unusual, and was like some cases referred to by me, as mentioned (pp. 79, 105), at Guy's Hospital, where "recurrent syncope" was noticed.

M. Poizat says he retired to wash his hands, but in five minutes his assistant rushed violently into the theatre, saying the young woman was dead!

that in passing along one of the corridors she fell insensible! "We both ran to the spot, and the following is a summary of what we discovered. She was stretched out, white as death; I seized her arm, the pulse at the wrist was only feebly discernible. I put my ear over the heart; it was nearly without action; a slight muffled murmur was heard; the respiration was also scarcely perceptible. The case struck me as one of unmistakeable shock or 'sideration' (c'était une véritable sideration le danger était imminent); the danger of a fatal termination was imminent. The patient was at once carried into the open air, but both cold air, cold water sprinkled on the face, aromatic vinegar, and even strong ammonia were administered without the least effect. My anxiety was excessive. I then tried mouth to mouth insufflation, and submitted the thorax to alternate compression and relaxation like respiration. A long gasp finally crowned our efforts, after a full and weary half hour, then a deep sigh, next a few other gasps, till respiration was at last, after a very considerable anxiety and intense long suspense, finally re-established, to our infinite delight!"

As one "addictus jurare," M. Poizat not very philosophically concludes, "Je maudissais déjà le chloroforme, et jurai a plusieurs reprises que je ne l'emploierais plus a l'avenir." (I vowed vengeance against the chloroform and asseverated very violently that I would never employ it again for the future.) This is an instance of the fourth stage of chloroform anæsthesia. This case is also perhaps another instance of the fact stated by many surgeons, that women bear the pain of surgical or other painful operations better

than men ; they seem, in fact, to suffer less ; thus cases are given by Mr Curling where women have had breasts removed before the time of chloroform, merely from hysteric excitement or imposition, wishing to be well fed and clothed in an hospital. Something similar occurred at Guy's, in Mr Bransby Cooper's practice! "Nothing is more common than paralysis of cutaneous sensibility amongst hysteric patients," says Duchenne of Boulogne, and in one case he observed what he terms spontaneous muscular anæsthesia in a hysteric patient. This is said also to occur more at the left than the right side of the body, if hysteria be not in itself a heap of anomalies and contradictions. Connected with this paralysis of cutaneous sensibility in hysteric patients, we find also Duchenne says imperfection or lessening of the sense of smell, hearing, taste, &c., the latter partly explaining the depravation of taste, such as eating chalk, mortar, &c., observed in hysteric women. Now, as said previously, we can very well understand the difficulty of placing such a hysteric patient under chloroform, from emotional or nervous alarm, and once under chloroform deeply, even in the second stage, the paralysis of cutaneous sensibility prevents the usual cold dashing of water on the skin acting as a restorative. The preceding case (one of a great many similar cases) appears to me to be an average specimen of what I have termed the fourth stage of chloroform, a stage, as I said before, not always encountered, but always to be apprehended or kept in mind. Dr Snow would have probably called it not cardiac syncope, where the cavities of the heart are always full and the lungs congested, but anæmic syncope, which he rightly described

as altogether different, and where the cavities are probably empty; the syncope of mental emotion is also of this latter kind. The phenomena may possibly be due to this, or to what I suggested formerly, the effect of imperfectly decarbonised blood going to the brain, and weakened muscular action of the heart, as seen in asphyxia (page 133). I may just mention one other form of this fourth stage. I saw a curious case not long ago at Guy's Hospital. A remarkably healthy lad was placed under chloroform previous to sounding for stone; the chloroform seemed to take very fully, but in a very irregular manner, and after the surgeon had detected the stone and left the ward after the operation, the lad fell deeply and alarmingly anæsthetic again. There was a curious pin-hole contraction of both pupils, the eye was also dragged by the abducens nerve to one side, cold dashing did not seem to revive him; after watching for about twenty minutes I spoke very loud, as I thought he was asleep; he suddenly woke up with a deep sigh, the pin-hole pupil widening in an instant to about the widest pupil I ever saw in a patient of his age. If not a slight epileptic fit in recurrent second stage, this was the fourth stage. He looked inquiringly about him, and asked "what it was all about," as he had been in a delightful dream!

Dr Snow seems never to have observed this fourth stage, but he described a toxicological "degree" or final stage, so frequently seen in healthy animals poisoned by chloroform,—viz., the breathing becomes irregular and feeble, supported solely by the diaphragm; the breathing then slowly ceases, but the heart continues to pulsate. A case of apparent

death recently given by M. Langenbeck, of Berlin, was of this character,—the patient was saved by tracheotomy and friction of limbs, as referred to before (page 78).

IS DEATH FROM CHLOROFORM A SIMPLE
COINCIDENCE.

The Paris "faculty" have for the third or fourth time decided unalterably, what has been also practically set at rest in a hundred thousand surgical operations elsewhere, that there is no additional safety whatever in adopting tubular inhalers or water-baths, Snow's apparatus, &c.

Ought the question of life or death to arise from the administration of chloroform? ask the authorities in Paris; popularly speaking, it unfortunately does, is the answer; but in a scientific point of view it does not, and ought not. Experiments without number and tens of thousands of operations in hospitals under chloroform say there is no danger in pure chloroform carefully applied in moderate doses (p. 108). Animals that are readily anæsthetised in the ordinary manner by moderate doses of chloroform are as readily killed by enlarging the dose, says the 'Société d'Emulation,' after a long series of experiments. Still in operations on man we are thrown back on singular facts. Nervous sideration or idiosyncrasy is a thing or fact that we must explain;—the fact by itself, and commit a *petitio principii*, says M. Duroy:—"C'est expliquer le fait, par le fait lui même c'est commettre une *petitio principii*." And M. Duroy is right; this is all we can yet do; yet idiosyncrasy explains very little, nor is the word sideration more happily chosen.

It seems in Paris that it is not the entire quantity of chloroform taken into the system during a period of an hour or hour and a half that it may be administered that is considered to be of danger, but the largeness of the quantity at any one specific time. Some grammes of chloroform (50 to 60 drops) inhaled suddenly by a large dog kills it, but the same animal will take without danger 30 or 40 grammes (300 or 400 drops), sufficiently diluted with air, spread over a longer interval. This is exactly in another form what I have striven to explain in other words, as to maximum and minimum doses (pp. 110, 131).

In this discussion—going on for some time, indeed with no little anxiety, in all the hospitals of Europe—a very prominent place has been afforded to some other points, such as the question of what are the more obvious precautions taught by experience and necessary to be observed in the safe administration of anæsthetics; and in what consists the superiority, if any, of common æther over chloroform, or amylene or acetone over æther.

PREPARATORY TREATMENT OF PATIENTS — PRECAUTIONS AND CONTRA-INDICATIONS.

The precautions to be observed in the administration of chloroform or æther, as well as the preparatory treatment necessary to be directed previously to the patient being rendered insensible, are best described, and only to be understood at the close of a treatise like the present. The patient must of course be in a recumbent position, lying on his back or on the right side. It is well also to have one window of the apartment where the operation is performed

open at the top, and a draft of air through the room as fresh as possible (pp. 60, 81).

The age, sex, temperament, idiosyncrasy, previous existence of nervous diseases in each patient, will first pass in review in the mind of the surgeon before he administers chloroform. He will do well also to take into consideration the exact nature and probable duration of the surgical operation for which each particular patient requires the anæsthetic; he will then at a glance be enabled to apportion the dose of chloroform, at least in an approximate manner to any of the three first stages of the etherisation process. We cannot be too cautious, I think, on this point of the stages of chloroform. I believe it is always better to begin to give chloroform in a quiet darkened bed-room or ward, before the patient is brought into the noise and agitation of the operating theatre. Mr Erichsen and one or two other surgeons in London adhere to this rule. The patient should be further prepared for the operation according to the nature of the case and the usual rules of hospital practice, and a confident cheerful demeanour observed towards him. It would be well if he has had no medicine of any kind for twenty-four hours, as some medicines pre-dispose the patient to syncope. Patients should also be carried away out of the operating theatre, and not allowed to walk, as they may faint and fall down (p. 153).

By a little delicate observation of chloroform patients, and keeping in mind some of the points made out this year in the minute anatomy and physiology of the spinal chord and the brain, we occasionally perceive that the degree of anæsthesia or loss of consciousness of pain does not keep pace

with the exact degree of narcotism of the brain proper. There is no inconsiderable variety as to this; depending, I believe, on the nature of the disease under which the patient happens to be labouring. Some cautious surgeons think it possible to amputate, for instance, when sensibility to pain is gone, and before perception of the operation is lost. This may be occasionally possible, but certainly not always.

The ganglia of sensation, *e. g.*, the optic thalami, seem to require a slightly smaller quantity of chloroform to suspend this sensibility or feeling of semi-suffocation from the inhaler than is required to produce narcotism of the large complex cerebral hemispheres,—*e. g.*, in birds, where these ganglia are larger in proportion than in man, feeling is suspended almost in an instant. These delicate points often decide the exact instant to amputate! “These thin partitions which sense and thought divide” are all to be considered in the preparatory treatment of patients and the precautions to be observed in each special operation.

In offering strict rules for the exact dose of chloroform or æther to commence with in surgical operations, or what may be termed “maximum” and “minimum” doses of these agents, it would be obviously calculated to mislead the practitioner, as a matter of preparatory treatment, to set down any exact quantities others than those already stated (page 95). Each surgical operation under chloroform is as much a study in itself as each obstetric case that a practitioner may be called to. Our chloroform patient of to-day differs perhaps from our patient of yesterday; not less as to impatience at pain, temper-

ament, age, or sex, than by the nature of the surgical operation, or the presence or absence of various contra-indications.

Even the diseased condition for which, or the special part of the system where, the operation is about to be performed, will modify this action of the larger ganglia ; thus the delicate parts about the face connected with the nasal and lachrymal branches of the fifth nerve—the so-called “gustatory” and dental of the third branch, as well as the muscular and cutaneous twigs which form such a complex interweaving with the facial, comprise more sensitive parts, and require more chloroform than other parts, viz., the parts of the leg supplied by the peroneal nerve.

We need not refer again to the well-known precaution or necessity of the patient about to be operated on under chloroform being directed beforehand not to take any solid food for at least two or three hours ; all our most careful surgeons, however, are in favour of the exhibition of a glass or two of warm wine, or a little beef-tea, &c. ; solid food must be carefully prohibited, for reasons already specified.

Next to this is the obvious but simple precaution, when the patient has decided to inhale chloroform or æther, of having the handkerchief or dress quite loose about the neck and chest—especially is this necessary in the dress of females ; all pressure, indeed, on the thoracic walls should be quietly and without officiousness removed. Everything of this, too, should be done so as not to excite the alarm of the patient. If it seems to cause any apprehension it might be deferred for a few minutes, and then done when the patient is already insensible ; all

pressure on the chest should be rigidly prevented in every operation under chloroform or æther; as the respiration in deep anæsthesia in the third stage of either æther or chloroform is carried on as referred to before, as in natural or ordinary sleep, almost solely by the diaphragm. I fear this is too often forgotten. Dr Snow believed this was invariably the case in what he called his fifth or asphyxia stage of chloroform inhalation,* and that the intercostal nerves are then totally paralysed; the breathing, too, becomes remarkably irregular, and any undue pressure may stop it altogether.

When a patient plunges (as he will very often do) in the earlier stages of the anæsthetic process, and very remarkably so under amylene, it is probably due to loss of sensation and imperfect consciousness; he feels as if in an annoying dream, or railway tunnel, and he strives to get rid of the confused noise as well as the inhaler or other apparatus which partly impedes the respiration; by a *tactus eruditus*, easily acquired, and by speaking gently to him, and always by pushing the chloroform or amylene a little further, this plunging is prevented. Some persons addicted to the use of ardent spirits often

* I have long deemed this fifth not a stage of practical value in the operating theatre, as it is never seen there. Dr Snow, as I conceive unnecessarily, has divided one of my "stages" into two, and has altogether ignored what M. Baudens and various hospital surgeons of great eminence term "collapse," or recurrent syncope, or what I term the fourth stage.

prove in a similar manner very refractory to the influence of chloroform.*

As one of the obvious, or rather one of the very doubtful precautions that may occur in a surgical consultation on the question of chloroform, it is necessary here to indicate whether for any particularly delicate patient there may be a choice of anæsthetics. This is a subject of a very conflicting kind. One hears the question often asked, What do you think of æther? It need scarcely be said that æther was in considerable use before chloroform was re-discovered or invented, in 1847, by Simpson and Waldie; so much so, that the earlier half of the preceding notes were allocated to æther, and the second half to chloroform; the discovery of Wells and Morton necessarily gaining precedence, being the greatest fact of the century.

Dr Snow entertained an opinion (and a mere impression of this kind by a man of considerable experience is worth more than any mere mechanical or isolated facts, or what may appear at a single glance) that æther is not so liable to sudden accidents as chloroform. Mr Coates expresses, however, an

* I am decidedly in favour of giving the patient before a long and tedious operation some water and a teaspoonful of brandy. In cases of ovariectomy, where chloroform was borne remarkably well, each patient had an opium pill and a good claret-glass of wine, containing a teaspoonful of brandy, immediately preceding the operation. I have seldom seen operations where the "law of tolerance" was so remarkable, as indicated especially by the pulse, or where the chloroform was borne so very well.

opposite impression. Dr Hayward, of Boston, as previously mentioned (page 51), had used æther a thousand times in America, and then, accompanied by Dr Bozeman, who was on another mission of a surgical kind, travelled to Italy and Germany to learn more about æther. He told me he saw it used in large quantities in Italy, and he believed it to be preferable to chloroform. In referring to the cases of sudden death collected by M. Trousseau, that very energetic physician says that we may value at tens of thousands the operations performed in the Parisian hospitals under anæsthetics; and from the form of Government control that prevails in that country, all the deaths in France have been carefully published (*publiées avec soin*); yet, as previously stated, of these forty-nine deaths thirty belong to chloroform and nineteen to æther—(*trente appartenant du chloroform, et dix-neuf à l'æther;*”) and his settled decision this year (1858) appeared to be that although chloroform was then almost exclusively preferred, it was impossible (by comparing an equal number of surgical operations varying over different epochs) to impute to it a greater amount than one-third more deaths than to æther. Two authentic deaths from æther in England are given in 1847, and two deaths from æther ten years later, equally certain, in the practice of MM. Barrier and Valette, of Lyons.

As a general rule, in large cities, it is well to apply chloroform with an inhaler, but still this need not prevent a surgeon, in any sudden emergency, having recourse to any simpler means with equal success. The period or time usually expended in bringing surgical or other patients under the in-

fluence of chloroform is subject to many singular anomalies. In 150 operations of this kind, one after another, at Guy's Hospital, under chloroform, carefully timed by a watch by one of the surgeons, he found that a large proportion of the cases took fifteen minutes, but others only four minutes before anæsthesia in the third stage was induced. In some operations, in not a few special patients in such operations, for instance, as staphyloraphy, hare-lip, &c. ; and in hysteric patients, or obstetric cases, it is generally advisable, if not necessary, to avoid the third or later stages of narcotism ; or, *vice versâ*, in other cases, it is on the contrary preferable to push on to this third stage as quickly as convenient, for reasons already described : in other words, to give chloroform quickly, and in fair, large doses, in all rapid operations. All very slow operations, like necrosis or some resections, however, will require chloroform to be administered very slowly, except that in some smaller resections the surgeon is occasionally called on to operate while the diseased ankle or knee is in a state of excessive pain, or the joint may be inflamed in an active degree,—and here the pain should be entirely removed (page 124). One of our other chief precautions should be to procure perfectly pure chloroform. It is now found that some chloroform sought to be purified by sulphuric acid is actually destroyed* by that compound.

* It is unfortunate that, in mixtures of chloroform and alcohol, the former escapes in form of vapour, but the latter remains behind ; and if a conical sponge has been used as an inhaler, it requires constant squeezing to get rid of the spirit. If æther be used as the mixture with chloroform, it is probable

RULES FOR RESUSCITATION OF PATIENTS IN
THREATENED DEATHS FROM ANÆSTHETICS.

The other contra-indications and precautions to be observed, in addition to the purity of the chloroform, duration of operation, &c., will include the caution or circumspection necessary in diseases of the centre of the nervous system, or medulla oblongata. Various anæmic affections in females, and probably many hysteric symptoms depending on anæmia, which contra-indicate the use of narcotism, any previous history of delirium tremens in old patients, arachnitis, atheromatous arteries, dilated heart, must also be entertained with some misgivings, but need not contra-indicate or bar the adoption of chloroform. As to age of patients, an eminent surgeon of the Hôpital des Enfants in Paris, with whom I very much or entirely agree, is accustomed to say that if chloroform be banished from modern surgery, it may take refuge in the future surgery of children's hospitals. In these cases of children, in such institutions, we have an absence of atheroma and delirium tremens as well as a freedom from heart disease, especially fatty or dilated heart: we have, in a word, a healthier system to work with; and when syncope or asphyxia may threaten, the reflex and sensitive functions are brought with more certainty and safety to answer

the æther is first inspired, but with less excitement than that caused by chloroform. Chloroform is soluble in alcohol and æther, in all proportions, and in about 300 times its volume of water; chloroform holds about this proportion of water inversely, or 1 part in 300 of chloroform, and if separated by sulphuric acid, the chloroform is liable to undergo spontaneous decomposition.

to our modes of resuscitation. This may be said, I think, of all patients in a certain degree before the age of fifteen or twenty.

Asphyxia.—It may be well to remember that asphyxia is less to be feared when we are giving chloroform than syncope. Where the surgeon is suddenly startled by signs of asphyxia, probably in an old patient, the chloroform must be at once stopped. The continuous action of fresh air fanned on the patient's face must at once be substituted; artificial respiration should at once be commenced; *this is his sheet anchor* (page 60); cold water should be sprinkled on the face and neck,—too much should not be done at once; insufflation from mouth to mouth may be attempted, and the patient's bed at once removed into the open air: even bleeding may be advisable to relieve the sinuses of the brain, or as Dr Chapman suggests, to relieve the right side of the heart, the action of which he thinks is impeded by mechanical obstruction. If there be in any particular case mitral disease, with its characteristic dyspnœa, it is necessary to observe great caution. Large doses of opium may also do very serious mischief in such a case,—or opium or chloroform be entirely inadmissible. If electricity or galvanism be tried in impending death from asphyxia or cardiac syncope, I think it would be preferable, through the trapezius or sterno-mastoid muscle, so as to irritate the spinal accessory nerve; Valentin having shown very clearly that irritation of this nerve, or upper cervical nerves, will set the heart beating in animals long after the latter has ceased to act. Galvanism along the phrenic nerve might be useful, but not along the par vagum.

We see a good deal of late of localised electricity, or Faradisation in anæsthesia of the skin, but in accidents from chloroform, whatever is done must be begun in a single minute! And here it may be remembered that in asphyxia the right ventricle of the heart continues to beat longer than the left: hence, the blood collects in the lung,*—but still, though the pulse may have ceased, it may still be possible to restore life. I have examined or seen four patients who died from chloroform in hospitals, but I think fresh air and cold water are worth all the other restoratives put together! It is very possible, too, to do too much. It is probable that chloroform, though it may produce such a very grave accident as undoubted asphyxia or syncope, is still not dissolved in the blood; as in a large number of experiments by Nunnally he found that the fibrin and globules of the blood remained unchanged in animals thus asphyxiated. The colouration of the blood takes place, too, only in the most minute capillaries, not in the large bronchial tubes. Even pure oxygen does not redden the blood till after some time has elapsed, nor is it superior to common atmospheric air.

Bichât pointed out that the lung is an intermediate organ through which death of the heart occurs from such diseases sometimes as asphyxia; but at the same time he held that irritation or excitement of the lung might also sometimes wake up the heart: this, therefore, might be the class of cases where it might seem that oxygen gas might be thrown into the lung with advantage. I must say,

* Exactly the opposite takes place in fatal syncope.

however, that in a case of this kind that I saw at St Thomas's Hospital, a large quantity of oxygen gas was fortunately at hand in a minute or two, and was thrown into the lungs, but without any good effect. I witnessed a similar application of electricity in a case at Guy's Hospital—both patients were lost. My impression is that fresh air, and perhaps nitrous oxide, are the best modes of resuscitation, with or without the vapour of sal volatile or vinegar. Ligatures round the limbs seem to act by diminishing the area of the force, or sum of the forces which the weakened heart is called on to exert;—it is worth being tried.

Asphyxia, we may say in conclusion, leads to death by paralysis of all the muscles—even of the intercostals and diaphragm—by suspension of the process of hæmatosis of the blood, and penetration of black blood into the coronary arterics and fibres of the heart itself. Even the blood seen at surgical operations under chloroform will be scarlet, if respiration is unembarrassed, but in threatened asphyxia it becomes dark. In some operations there will, of course, be a preponderance of venous blood seen, but, *ceteris paribus*, though many observers will be looking like the knights of old, at opposite colours on the same shield—the colour of the blood under chloroform very much depends, not on the chloroform, but on the unembarrassed state of the circulation in the lungs (pp. 92, 108).

Syncope.—Here, in addition to what has been already suggested for asphyxia, except bleeding, it may be of vital importance to draw the tongue forward, after the index or little finger has been hooked into the pharynx, to find if any solid mass

of undigested food, as sometimes has been the case, is arrested in this region (page 59). We should place the patient completely horizontal, or with the head even lower than the pelvis; in syncope a few loud words should be spoken, and the back of the neck smacked roughly with a wet towel, as it is possible the "fit" may partake also of the nature of sleep. Aromatic vinegar or sal-volatile, not too strong, will be of some use if the patient should appear to revive; but I think tickling the ear, soles of the feet, and nose with a pen is more serviceable. If the patient can be induced to swallow some warm strong wine, it will be advisable; or with a stomach-pump and tube a little might be thrown into the stomach. Frictions with warm flannels, rubbing the limbs towards the heart, should at once be commenced, after a few sprinkles of cold water on the face and neck. All these means are to be continued for at least three, four, or five hours. If it can be conveniently done, some warm wine should be thrown into the rectum by enema, or localised electricity tried through the trapezius or over the heart. If the chloroform in such a case should only induce unusual excitement of the respiration or circulation, it is advisable to suspend it for a while, so as to afford the patient an opportunity of recovering his normal state, and deciding then whether it is better to stop or recommence its application.* If danger should prove all but in-

* In fatal syncope from chloroform, cerebral action is first stopped, and for want of excitation of the grey matter of the brain sensation is annihilated, next locomotion, and finally, the voice is interrupted.

evitable, it would be well to postpone the operation, if that could be done with safety. In cases of phthisis (not likely cases, however, to come under the knife of the surgeon), various anomalies are also met with, and such patients require very little chloroform.

In a very alarming case, in the practice of M. Laugenbeck, of apparent asphyxia, as the pulse ceased two minutes later than the respiration, tracheotomy saved the patient. One pupil was more dilated than the other, as if there was a fit. The patient, after inhaling $\frac{3}{4}$ of chloroform, became restless, his face dark red, and respiration struggling and laboured.

OF HYSTERIC FITS.

Some few surgical accidents (other than cardiac syncope and asphyxia), not peculiar to the administration of chloroform, æther, amylene, &c., should not be forgotten in our estimate of the value and usefulness of these agents. It is quite possible a very serious accident may occur during a surgical operation, and we should make a very great error in ascribing it to the anæsthetic at all. Reference was made by me in 1856, in an especial manner, to the prolonged "fits" likely to be induced in patients much affected by hysteria, when such patients, as is usually the case, especially in private practice, require large quantities of chloroform. I said at that time that a peculiar form of irregular anæsthesia seems to be induced in hysterical cases in one portion of the system, while the excess of chloroform appears to expend itself on other parts (page 84). I believe such patients to be in some

measure exceptions to the otherwise true and remarkable "law of tolerance," pointed out especially by Professor Miller and Mr Skey. Some of the researches of M. Briquet* on this subject more recently are very remarkable.

In referring before to what I have termed the

* In 1846, M. Gendrin stated that loss of sensibility is one of the most constant phenomena in hysteria, and that nervous women and magnetic somnambulists, whose insensibility is supposed to be trickery, are often merely hysterical women suffering under anæsthesia. Indeed, he went so far as to declare that all hysterical women exhibit anæsthesia in some parts of their body. But this is incorrect; for in 400 hysterical women, observed with every possible care, M. Briquet was enabled to detect it only in 240. *i. e.* in 60 per cent. In this investigation, however, *insensibility of the conjunctiva of the left eye*, which is met with in the great majority of hysterical patients, was not taken into account, as it was not sought for in all the patients, and its proportion could not be stated.

Anæsthesia not infrequently immediately succeeds the hysterical paroxysm, but this is not always the case as it is stated to be by Gendrin. Thus, of 221 women suffering from anæsthesia, in 160 there had been, and in 61 there had not been hysterical paroxysms. In a certain number of cases the anæsthesia preceded the paroxysms. In some instances it has appeared after great emotions, in others it has succeeded hyperæsthesia; and occasionally the skin covering muscles in a state of hyperæsthesia is itself anæsthetised. In general the anæsthesia is produced in hysterical patients as a consequence of some considerable perturbation of the economy: and if we call to

fourth stage of the chloroform process, a remarkable case of this resistance to anæsthetics was cited (p. 152). A hysteric patient may thus cause very considerable alarm to the persons standing by in an operating theatre; there may be profound insensibility present, in fact for many hours after—interrupted, it may

mind the ordinary effects of emotion on the colour and temperature of the skin, and on the functions of the senses, this diminution or loss of sensibility will not appear very extraordinary.

The development of anæsthesia may be slow and gradual, and is then preceded by tingling, shooting pains, or numbness in the parts. In other cases, none of these have been present, and the patient is only made aware of the insensibility by her attendant; and again, it is not rare to find it coming on quite suddenly after a fit or emotion.

When the anæsthesia is very extensive it is always accompanied by a very persistent and intense cephalalgia, seeming to indicate the brain as the point of departure of the disease. The diminution of sensibility varies in extent and intensity. The entire surface may be affected, or only a very limited portion of this, as a foot, a leg, an eye, etc. The anæsthesia may engage only the surface of the skin, or it may extend through the whole substance of a limb, involving the bones. It is common to meet with anæsthesia of a whole side of the body and of the organs of sense of the same side; but whatever may be its extent it only involves those parts which are under the influence of the cerebro-spinal system, never those supplied by the sympathetic system, as the lungs, digestive canal, heart, etc. Thus anæsthesia of the trunk never penetrates the splanchnic cavities. Moreover, the insensibility only affects the peripheric expansion of

be, with gleams of hysteric laughter, and this may go on for twenty-four or thirty-six hours, nay, two or three days, but still there may be little or no danger—at least, little or no danger if the case be recognised to be hysteria, and bleeding, galvanism, or the nerves, the trunks retaining all their sensibility and excitability. Just the contrary of this happens in hyperæsthesia.

The duration of the anæsthesia is very variable. When partial it is sometimes only temporary, disappearing of itself. In other cases it persists for a long time, until the hysterical phenomena themselves have ceased; while in others again it may last for years, in spite of the hysteria itself having disappeared. When the anæsthesia affects only the surface of the trunk of the body, it is often of so little inconvenience to the patient that she is not aware of its existence, although a whole side may be affected; but when the extremities, the muscles, or the senses become affected, it is very troublesome. The detection of the anæsthetic condition is simple enough, as it suffices to touch, pinch, or prick the affected parts.

In M. Briquet's 240 examples of the affection, there was not one in which the skin did not suffer from some form of insensibility. With respect to its seat some curious particulars may be stated. The entire surface of the body was affected in 4 patients. The entire half of the body, constituting a kind of hemiplegia of sensibility, was affected—the left side suffering in 116, the right in 25, while in 3 others, with anæsthesia of the left side, the right side was also slightly insensible. In these cases of unilateral anæsthesia, it is usually very exactly limited to the mesial line both before and behind.

other very active means be not resorted to. A hysteric patient has been known to remain for a period of three days quite insensible after chloroform, and then her sudden return to consciousness be not less remarkable, but satisfactory. A case of this kind occurred in the experience of Dr Snow.

An irregular or failing action of the heart during the early stages of the chloroform process, as previously mentioned, suggests especial caution. I have watched the pulse in many hundreds, nay thousands, of cases of common operations on this point alone, but it is fortunately not of frequent occurrence; the chief precaution necessary in such a case is to lessen the quantity of the chloroform and increase the amount of fresh air by opening the doors and windows. My experience now leads me to think that the quantity of chloroform (3ii vel. 3iiss.) that the tubular inhaler requires, and which Dr Snow was accustomed to commence with in operations on adults, is rather too large; he usually left the expiratory valve of his inhaler open, it is true, nor was the inhaler kept constantly applied to the face, but by the precaution of allowing the patient to take a full inspiration of fresh air about every half-minute, Dr Snow was able to gauge, as it were, the effects of the chloroform. In my own inhaler, which is very simple, and contains a sponge valve or diaphragm, I find 3i or 3iiss to commence with in adults answers every purpose. Everything depends, however, on an experienced gauging of the chloroform, and of its effects on each patient respectively, taking five minutes as a fair average as to time. When there are anæmic or spanæmic murmurs present about the base of the heart or root of the neck,

or signs of facial paralysis, chloroform is not advisable. Artificial respiration with transfusion of warm water slightly salt has been ingeniously recommended where a patient is lying as it were dead after chloroform; the suggestion is a good one; any one who has witnessed the marvellous effect of this transfusion in the collapse of cholera will recognise the analogy of the two conditions. Cold water and fresh air quickly applied, however, will form the most reliable resources in cases of threatened syncope or asphyxia from chloroform; where the patient is hysterical, time will probably bring her all safe.

In using a cone of lint in giving chloroform, it should not be over-saturated, and Mr Erichsen recommends a towel to be thrown loosely over the face. I have seen this plan adopted hundreds of times with great safety and success. In all hysterical women and in operations on children it is advisable to give chloroform in another apartment. A small portion of oil should be smeared on the lips of such patients, and, indeed, of all patients previous to the administration of chloroform, as this anæsthetic in particular has a tendency to blister the lips rather severely; the towel thrown loosely over the face, as just indicated, assists in inducing anæsthesia by shutting out from the patient's vision various external sources of emotion and alarm, such as the alarm caused by surgical instruments, friends weeping, &c. &c.

OF "SHOCK" IN SURGICAL OPERATIONS.

Of the fatal accidents not peculiar to chloroform, æther, amylene, &c., that may unjustly be ascribed to these agents it is not necessary to say a

great deal, as they must be familiar to the *habitués* of operating theatres. Thus, it is related of Desault that he was one day about to perform the operation for stone; the patient did not present anything unusual in his appearance, and was placed in the usual position. Desault traced simply with his thumb nail an imaginary line on the perineum where the incision could be made; the patient uttered a yell, fell into a fit of syncope, and died almost in an instant before he had been touched with a cutting instrument. Mr Stanley tells of a very similar case occasionally in his clinical lectures, in the practice of Mr Earle. I have heard others in other hospitals of a like kind.*

* A singular case appeared in the 'Times.' Some factory girls were frightened in a dark lane by a coffin, placed there by some boys; one girl shrieked and fainted, but never rallied. At a post-mortem, it was found that the contents of the gall bladder were effused into the peritoneum by the sudden shock, the gall bladder having been torn across! We do not know what is going on in a patient's mind, under even the most trivial operation. Thus a case, by Garengeot, is well known: A patient with a wound on the thumb, at the bottom of which a tendon was seen to move, was so alarmed when the wound was opened at the living thing moving that he got a shuddering fit, and died on the instant. It is stated of Chopart, also, that in operating for circumcision, the moment the first touch was given of a knife the patient fell dead. It would be obviously unfair to ascribe the accident in any of these or other similar cases just narrated to chloroform, if that anæsthetic had happened to have been used.

"In the very first case in which it had been intended to give chloroform," says a recent number of 'Household Words,' "Dr Simpson was unable to be present and it was withheld. The patient died suddenly after the first incision had been made, and with the operation uneompleted." This is a case on the other side of the question, and if this patient had even smelled chloroform it would have got the credit of the accident.

Our literature abounds, of course, with scenes intended to convey the effect of mental "shock." Of this kind, take the case of the helpless King Lear, who becomes violently insane, from an apparently simple cause, the ingratitude of his daughters. How true this effect of mental shock is I need not stop to point out. In the hospitals of Paris in 1848-49, where I saw about a thousand operations under æther or chloroform, amongst the unhappy insurgents of that ill-fated city, and in the hospitals of London, where I have seen on an average the same number of operations each year since 1849, this effect of mental "shock" has often been witnessed.

The effect of chloroform, as we have already indicated at considerable length, varies under a multiplicity of circumstances;—thus, the more feeble a patient is the less will be the amount of chloroform that it will be necessary to use, whilst patients with well-developed muscles, as well as hysteric females, equally require large quantities of all anæsthetics. Children, too, will occasionally fall fast asleep after chloroform inhalation, whilst oldish people are slow and fretful in "coming round."

Among other circumstances likely to come under the consideration of the surgeon in every-day

practice, in connexion with the question of the propriety of using chloroform, the existence of pregnancy, or of another obvious action of a periodic kind in the ovary, may come under discussion ; but there is nothing whatever in either of these states to contra-indicate the careful administration of anæsthetics ; in the former instance the vomiting is the complication most to be guarded against. Bickersteth and Snow are probably right, too, that chloroform ought to be given, especially in heart diseases, attended with palpitation, but given with caution, as the emotion in the patient's mind, caused by the dread of the pain of a cutting operation, is more serious than the likelihood of danger from the chloroform. It has been often objected to use chloroform in the operation of ligature of arteries, like the femoral, as from absence of pain the surgeon may include the nerve. But it should be remembered that the chloroform is only used in order to lessen the pain of the earlier incisions, that a patient will remain fully three minutes insensible before the chloroform requires to be renewed, and that at the end of this interval the ligature, previously passed round the vessel, might be tightened ; perfect consciousness, as a general rule in operations, is restored in about eight minutes from the discontinuance of the chloroform.

“ Chloroform, in lessening emotion and ‘shock,’ ” says M. Bandens, “ conferred on the wounded in the Crimea a calmness and tranquillity of mind very favourable to a cure ; it took from the traumatic fever that seriousness and that re-action which otherwise follows (*inquiétudes morales*) mental or constitutional disturbance.” And speaking of the field of battle, this experienced surgeon says also, — “ Death

occurs during very serious operations, more often, however, from (*par épuisement nerveux*) nervous collapse or shock (*par excès de souffrance*), by excess of pain, than as a result of bleeding (*que par suite d'hæmorrhagie*).” This was also the experience of Mr Guthrie, who, in his characteristic mode, used to say that “the horse-loads of tourniquets sent to the Peninsula and other seats of war were never required at all; patients died of shock, and almost never of hæmorrhage.”

That death, or other serious accidents, may occur during the inhalation of chloroform vapour, but still be independent of the chloroform, I have now very little doubt. There has been of late times a tendency to adopt, in anæsthetics, the *post-hoc* for something else—an old weakness or failing in our occasionally illogical, but—must we say it?—always dogmatical medical literature.*

* A case of anæsthesia very much in point, which the writer also witnessed, has been commented on by Dr Snow. The patient was operated on by perineal section under amylene, and did not seem to suffer much. He told us, however, he was anxious for amylene, as he had previously suffered in other operations very much from the after effects of chloroform. Rigors, bilious vomiting, coldness of extremities, and delirium seemed alarming enough; but Mr Syme long since pointed out that, even independently of chloroform, the surgeon will now and again meet these symptoms of constitutional disturbance from the operations of the perineum.

In this patient, moreover, we thought that for several days he was suffering more from large doses of opium, given to quiet the system, than from the effects of amylene. There seemed also an excess of

Of something like forty-five deaths collated by Dr Snow, with his usual accuracy, his impression was that at least five or six of these deaths were like the cases of sudden accident in the practice of Desault and Chopart just given; purely the result of emotional depression or fright on the operating table. It will be difficult to persuade the public of the possibility of this, or the danger of previous or antecedent disease in those about to take chloroform. It is Mr Mill who makes the true observation that there has been always a tendency in science to associate the idea of cause with the one proximate antecedent event, rather than with many antecedent events; the reason being, as he explains it, that the event begins to exist immediately previous, whilst the other conditions or events may have pre-existed for an indefinite time. A patient dies whilst inhaling chloroform from a piece of folded lint, and we naturally, but unfairly, give the lint the credit of the death, rather than a latent epilepsy or a rheumatic endocarditis that may have occurred ten years before, and destroyed the delicate valve work of the heart. Mr Mill cites the death or assassination of one of the Cæsars, which was preceded by the appearance in the sky of a comet, and the "two were for many centuries after connected

urea and ammonia in the blood, as the opium checked the action of the kidneys. This case teaches, in fact, that we can seldom do harm by preparing our patient beforehand for operation, and that there are several contingencies in all surgical operations, even without chloroform, that it is not fair to visit on anæsthetics, and which we should study.

as cause and effect, but the deeds and acts of Cæsar were left out." Light causes good vision when we light a lamp, "but there is also antecedent education of the eye," continues this very able writer. This education of the eye has as much to do with vision as the light of the lamp. We read now of deaths from chloroform during inhalation from a sponge or compress of lint, but we read also in the statements of one writer (Dr Graeme), that chloroform at first was given "in pints," especially in obstetric practice, and the patient kept for hours in a state of snoring and insensibility! Again we read of deaths from chloroform, but where the wrong means of resuscitation were had recourse to. My object in referring so much in detail to the fatal accidents from chloroform in hysteric patients, and to the anæsthesia naturally existing in some of these cases, as shown by M. Briquet, is, of course, to point to the strong probability that, if the conjunctiva of the eye be insensible from hysteria, we are likely to be misled as to the quantity of æther or chloroform necessary in such a case. It appears to me that the danger in such patients as these (as in a case of death from chloroform at Epsom, in the fourth stage) depends very much on the fact that the chloroform induces, in the second stage, irritative spasm of the glottis or its muscles, or the hysteric paroxysm, together with this anæsthesia of M. Briquet, or this fourth stage (page 152), which is entirely misunderstood, but that then our ordinary restoratives (that act so instantaneously in bringing 999 patients in every thousand back to consciousness) are entirely without force or effect; indeed, almost as much so as they would be, under similar

conditions, in an epileptic fit! The patient here does not so much die from an excessive dose of chloroform as from the *minimum*, or irritative dose. Such cases are very alarming. Time will no doubt bring round these hysteric patients; still it is not clear to me but that too much cold dashing of water, too much stifling and crowding round the patient, &c., help to protract the fits, and that galvanism, bleeding, oxygen gas, &c., are inadmissible.

MINOR SEQUELÆ OF ANÆSTHESIA.

These are occasional headache, vomiting, rigors, exhaustion, errors of the senses, and, in pregnant females, the liability to abortion or premature labour occurring.

Of the minor *sequelæ* attending on the administration of chloroform in surgical operations, obstinate vomiting is one that occasionally gives very considerable trouble to the surgeon;* it seems, however, as yet, from what is seen in hospitals, almost as impossible to recommend some true specific for the vomiting of sea-sickness as for the vomiting attending on chloroform administration during such operations.

If a patient threatens, or is inclined to vomit, it

* Mr Jones, of Jersey, nearly lost his remarkable case of resection of the scapula from the obstinate vomiting and exhaustion that set in immediately after the operation, due no doubt to the chloroform. The only thing that seemed to check it was a peculiar kind of soup of conger eels! used as nutritious food in his hospital, which was administered to the patient.

must be encouraged, but he should be kept also as quiet as possible, and completely recumbent on his right side. The vomiting, as stated previously, comes on near the termination of the surgical operation; and when the patient is excited, and is relapsing into the second stage out of the third, he should be disturbed only as little as possible, and after the operation allowed to lie for an hour or two. Cold brandy and water often checks vomiting and sickness. A little ice to suck is very grateful and useful, as well as creosote in form of pills if the vomiting continues for any long time, or a mild aperient may be substituted for the creosote, which rarely fails to carry off the sickness.

It is suggestive that vomiting is not common in obstetric practice, though here the chloroform is very seldom pushed on to the latter stages; this depends, perhaps, on the patient being recumbent. This disagreeable vomiting is not peculiar to chloroform, and vomiting, it is worth remembering, is not so common under the use of amylene, as it was remarked only in six cases of the first eighty patients.

A case was communicated to M. Nélaton, where a very urgent surgical operation was required in a woman deeply intoxicated (railway accidents are often of this kind), but the woman vomited, and never recovered. The French surgeons are particularly demonstrative on this point, as well as the necessity of the stomach being empty: thus, a case is given of a patient restored to life, who was thought to be lost from chloroform; but the man admitted he had taken an entire bottle of champagne immediately before he was placed under the chloroform, "merely to keep his courage up." And in mentioning this

case, the French surgeon remarks that in one of some similar cases of death by amylene, described by Dr Snow, it is passed by as non-essential that the man drank a full bottle of ale immediately preceding the operation. Such liquors distend, if they do not paralyse the stomach, and prevent the descent of the diaphragm.

Errors of the senses are not uncommon. Amongst the "sequelæ" we referred to aberrations of the sense of "touch." The action of chloroform, according to M. Flourens, is progressive: first, on the grey matter of the brain*—the cortical; next on the white substance which presides over sensibility; then on the anterior columns of the cord, and finally on the medulla oblongata, or "nœud vitale."

The return of the functions after chloroform anæsthesia takes place usually when the anæsthetic is withdrawn, in the inverse order of this progression: thus, the anterior columns of the cord are engaged in the convulsive plunging of the patient, but this ceases; then the power of directing muscular action returns, and finally the mind, or sensorium, becomes clear. Occasionally, however, a patient will preserve a most provoking wakefulness of some one of the *special* senses all through a surgical operation under chloroform; he sees though he is deeply anæsthetic; or more commonly, he hears

* The corpus striatum and optic thalamus, so deeply and specifically affected by chloroform, according to the most modern views of cerebral physiology, are internal convolutions, or act in the same manner as external convolutions in relation to consciousness and thought.

every word said, and the patient will direct the surgeon what exactly to do, as a man might direct his steps in a state of somnambulism, but still be completely insensible.

All this is mentioned that the young surgeon who applies chloroform for the first time should not be led astray by what a patient may talk during an operation; thus, a patient will quite commonly say that he has heard the saw dividing the bone, or the actual cautery streaking out lines on a joint, yet, still, he has been fully anæsthetised. The true tests in these cases must be, not the condition of the special senses, but the sensibility of the conjunctiva; the fact, also, whether the eye-ball still turns up or not, or whether, the rigid state of the muscles of the second stage having yielded to the lax or unresisting state of the muscles in the third stage, the patient may be fairly decided to be completely anæsthetic.

It is quite possible for a patient—one patient perhaps in a hundred—to preserve the most perfect use of the faculty of seeing, yet still common sensation to be entirely abolished. I do not know if the discovery of Swan bears on this fact, but he has recently demonstrated some singular and startling relations of the optic commissure with the purely intellectual portion of the brain, rather than with the centres of common sensation! Whatever the explanation, the fact itself, as one of the minor sequelæ of the chloroform process, it is occasionally liable to mislead.*

* There are some apposite remarks in Loeke (book ii, chapter xix) on the mode or method of thought of the mind, that bear in no remote manner

Abortion in females also has been known to follow the vomiting attending the administration of chlo-

on this singular phenomenon of the special senses resisting the action of agents all-powerful as regards common sensation. The perception accompanying an impression made in the body by an external object being distinct from all other modifications of thought is called a sensation. "The same idea recurring without an impression on the external sensory by the same object is called remembrance; sleep without dreaming is rest from all these, and dreaming is having ideas (of the remembrance?) not suggested by external objects nor under the conduct of the understanding;" and a little after Locke says, in this "retirement of the mind from the senses it often retains an inherent manner of thinking, which we call dreaming, and last of all sound sleep quite closes the scene. Is it not probable that thinking is the action and not the essence of the soul, since the operation of agents will admit of intention and remission? But the essences of things are not capable of such variation." It is very remarkable to find Brown-Séquard and Swan, from an opposite but corroborative point of view, in addition to these sensations and remembrances, giving us sensations which do not form ideas, but form reflex actions not recognised by the mind. Locke has a fine fancy in another part of his work, speaking of such impressions in the brain as "lasting through a lifetime as though graven in marble." Yet we find the flames of a fever in a few days *calcine* all these images in marble to dust and confusion!" It is to me probable that chloroform in the same way acts, in a temporary manner, on all these parts of the brain too; but possibly, as it is carried in

reform, for such a simple affection as neuralgia of the face! In the 'Edinburgh Medical Journal,' Dr Robinson has published such a case. We are told that on the morning of the day in which this occurred the lady was engaged in the duties of her household affairs, as well as usual, with the exception of a slight tooth-ache. Her sister, living in the adjoining house, had, for some time past, been in the habit of using chloroform by inhalation, quite freely, to relieve a facial neuralgia; and happening to come into the house of Mrs N——, found her suffering, as she believed, from a similar cause, whereupon she immediately procured her bottle, and dropping a quantity upon her handkerchief, urged her to "snuff freely until she would begin to feel happy." Leaning back in her rocking chair, she gratified her sister by full inspirations until the toothache was forgotten, and even sensibility to severe pinches so much obtunded as to afford great merriment to the sympathizing and provident sister. She remained in this condition nearly a half hour, and it was even then most difficult to arouse her to a semi-conscious state, in which she expressed a desire to lie down on her bed. When asked if she was comfortable, and free from pain, she answered in the affirmative. In this dream she rested till about four o'clock p.m., when full consciousness returned, and on attempting to rise from her bed, vomited

a mere mechanical manner by the blood, it does not reach some of the very delicate molecules of brain matter connected with hearing or seeing, or some finer parts still that exist, like the cornea, by imbibition *from* the blood, but contain no blood.

freely, and then was seized with pains of labour, more severe than she had ever suffered before. This had continued a little more than an hour when I arrived. She at once informed me that she was in labour (a fact clearly inferred from her expulsive efforts, and suffering), and as she expressed it, "much before time," being in the fifth month. The fœtus was removed without delay, exhibiting no signs of viability. The after-pains continued in spite of anodynes for about six hours. But towards morning of the following day, she awoke from a refreshing sleep of two hours' length, quite free from pain; and from that time has continued to convalesce without any untoward symptom worthy of note.

AFTER-TREATMENT OF PATIENTS WHO HAVE TAKEN CHLOROFORM.

The after-treatment of patients, especially of those in whom the chloroform may have been taken irregularly, is an essential point that may not be passed over in a practical treatise on anæsthetics like the present. The more important portion of this subject will, however, come under the head of "Rules for Resuscitation" of such patients (page 166.) In a large mass of surgical operations under chloroform, nothing more is required than that the face and neck of the patient be sponged with cold water; and the more gently and more naturally consciousness becomes thus restored the better. The attendant who applies chloroform, however, will do well not to leave his patient till he can perceive that all the signs of anæsthesia have subsided, that the pulse is good, and all fear of syncope passed by. In a case at Beaujon Hospital, a patient much given to

intoxication was operated on for hernia ; it took twenty minutes before he was rendered anæsthetic. He went on for some hours very well, but some twelve or fourteen hours after, in the middle of the night, he died suddenly.

This was given as a case of death from chloroform, but I think I may fairly leave it to the judgment of sound hospital surgeons, whether this was a death from anæsthetics at all. Such a patient, slapped on the chest with a wet towel, his face fanned, and a little brandy or hot wine and water administered, would, of course, have been saved; but the report of the case says that the poor man called to the nurse for a drink in the middle of the night; he took some drink, the nurse again went to bed and left him, but a gurgling noise was heard, and death took place. The tongue should be drawn out of the mouth in such a case, and if the surgeon dips his fingers in sal volatile, as he is doing this, it is a capital plan; a sponge dipped in brandy or vinegar might also be squeezed into the back of the mouth. Pulling out the tongue in this manner acts by drawing forward that organ—thus relieving the air passages; it excites the rima of the glottis, and it enables us to extract any lump of meat or food that may be in the pharynx.

M. Robert, one of the best judges of chloroform now in Europe, says that he has no faith whatever in the mouth-to-mouth insufflation of M. Ricord, who has seen four cases of impending death, he tells us, in as many months,—while at the Hotel Dieu, and in all the hospitals of Paris for eleven years, this other gentleman (the Dr Snow of Paris) has only seen two such cases of death. I can most

fully indorse this statement as regards the London hospitals. In following the plan of insuflation, the stomach and bowels of the patient became distended—in fact, like a drum—but the lungs ceased their office!

Electricity is entirely or nearly useless in accidents from chloroform; it will irritate the diaphragm, but is without effect on the heart; it will excite various other muscular organs, but it is, practically, of no value in these cases.

The rules for resuscitation of patients in threatened accidents from anæsthetics that we have just laid down are founded chiefly on the results of hospital practice, and the nature of the various “sequelæ” already indicated. In the after-treatment it will be observed that old people are sometimes slow in “coming round,” but children will partly come round and then fall asleep, which need not be disturbed. Hysterical patients are those where I find the greatest trouble, but still there is seldom any cause for alarm. Some sleep in a darkened apartment is the best restorative measure that can be adopted. It has been said in Ireland that “excruciating pain” sometimes follows chloroform. I am inclined to believe that here we have nerves tied, or the patient is rambling and incoherent. There is the greatest possible variety in the state of patients after they have had chloroform, but not one in a thousand need cause anxiety. And I am quite gratified to find that the experience of M. Robert agrees with my own as to the danger of “minimum,” or fifteen-drop doses. “On peut donc dire,” says M. Robert, “d’une manière générale, que la mort s’est produite à un moment où le sujet n’avait pas encore pris beaucoup de chloroforme.”

In eleven out of fifty deaths, chloroform had been taken more than once, so that idiosyncrasy was not the cause of the accident. Trials "d'essai" of chloroform, as the Paris Faculty used to call them; trials of the patient with small doses on several occasions previous to the final trial at the operation, are not now recommended. It has been pointed out very recently that in such operations as that of removing a testis, where a large nerve is of necessity divided, that at the moment of dividing this nerve there is a perceptible sinking of the pulse. I am inclined to think this phenomenon is due to the occurrence of vomiting and nausea at this stage of the operation.

Operations on sphincters, tendons, and nerves, I think are always such as to require considerable caution and vigilance in the after-treatment. Patients sometimes exhibit signs of great agitation, with interruption of the venous circulation and development of flatulence as they struggle out of the effects of chloroform; here one is almost sure to find that the patient has unguardedly filled his stomach with food. I do not think, however, that vomiting need be encouraged in such cases.

In some of our hospitals at operation time, there is a display of the electric battery. I never saw it used but once, and then, even at Guy's, nobody knew or could fancy what it was to do! Fresh air and artificial respiration were neglected for electric sponges, suffocating batteries, and other *niaiseries*, but the patient died irrecoverably, half smothered.*

* One death in 6,000 or 10,000 cases of the administration of chloroform is about the present

The chief study of the educated surgeon, next to saving life, should be to relieve pain in every possible manner; to make every sad and suffering patient's case, in a word, our own, and to do to each exactly as we would be done by if placed in the same circumstances. Surgeons, as a matter of business, become accustomed to pain, but does the patient do so? Or, let us take another ground—Dupuytren compared pain to hæmorrhage, and thought it a “letting out” of nervous power. A death from pain is a very different thing from a death from sudden emotion. The pulse and breathing, and the attack of syncope, are the index of the emotions, and we are in some measure forewarned by them as well as by want of sleep, exhausting irritability, anorexia, &c., as in the wounded at Lucknow, where chloroform failed the surgeons; but pain is a “letting out” of nervous power, which it is in the hands of the well-regulated surgeon to stop if he wishes. There is a great deal in the bearing of a surgeon towards his patients, also whether he wishes to believe that chloroform is a blessing or not; we should, however, not be beaten by the dark ages!

The anæsthetic of Moa Tho, the Chinese surgeon, was a preparation or “potion” of Indian hemp

authentic average; but in France and Italy, where venesection is very common, it is an actual fact that there are about four deaths to six in the same number of single bleedings in apothecaries' shops from phlebitis and syncope! So that the scalpel and lancet are six times more murderous than the often calumniated chloroform bottle.

("Ma Yo"), similar to that referred to by us before in Herodotus (p. 138). M. Stanislas Julien has been at the trouble of translating the original Chinese manuscript; it is of our third century! Moa Tho says, "when a bad surgical case did not yield to acupuncture, he tried moxas; but if the disease were situated in deep places where needles or moxas, or liquid medicines failed to reach,—for example, in the interior of bones, in the stomach, or intestine (hernia?), he gave the patient a preparation of "ma yo," and in a few moments the sick man became as "insensible as if he had been dead drunk, or deprived of life;" then, *suivant le cas*, this Celestial says he practised incisions, "openings or amputations, and removed the cause of pain. After a certain number of days the patient found himself quite restored, without having suffered during the operation the least pain." This is a very remarkable discovery, as said before (p. 4), amongst our musty book-shelves.

Guy de Chauliac reproduced these things of Moa Tho and the extraordinary anæsthetic of Theodoric without attaching the least importance to them; but Shakespeare, who was well read in Boccacio and the Italians of that age, has evidently looked on them with a more philosophical eye.

Very eminent surgeons, even so late as 1835, decided, against Boccacio, that sufferance was the badge of all things submitted to the surgeon's knife. In that year Velpeau said—"Eviter la douleur dans les operations est une chimère qu'il n'est pas permis de poursuivre aujourd'hui." This "aujourd'hui" is remarkably fine. In October 1846 æther was first used by Morton. Mr Cock, Magendie, and Lallemand, like Velpeau, held out against

the absurdities and immoralities of æther ; but I was fighting then, as I am found fighting now, against the greater absurdities of their arguments.*

Two deaths mentioned at the Hôtel Dieu were sudden and almost instantaneous ; one a chloro-anæmic lady residing at Boulogne, and a patient recently in the practice of M. Richet, where the chloroform failed to produce anæsthesia in a case of luxation of the shoulder, but on the instant of the reduction of the luxation the pulse stopped ; the respiration went on as before, but the man was dead in a few moments.†

Though chloroform at first quickens and excites the pulse, it is well to remember that the permanent result of chloroform, when given in full doses, either by inhalation or by swallowing, is to depress and bring down the rate of the pulse (Simpson). Still I have my doubts if any of the cases of death that occur after the lapse of the first four or five hours after an operation are fairly due to chloroform.

* See the 'Medical Times,' *passim*.

† This case struck us at the time as remarkably similar to some cases published by Magendie of sudden death from injuries to veins. I am quite a convert to the air-pump vacuum theory of the veins and right side of the heart as filled or acted on by elastic cartilages of the thorax.

"Un serrurier," says Magendie, "âgé de 23 ans, portait depuis près de cinq ans une tumeur volumineuse sur l'épaule et la clavicule droite ; les douleurs vives qu'il ressentait l'obligèrent d'entrer dans un hôpital pour s'y faire opérer. On fut obligé, dans l'opération, de couper et d'extraire la portion moyenne de la clavicule. Jusque-là, l'opéra-

Thus M. Giraldes gives two cases of so-called accidents from anæsthetics, one after æther, the second after chloroform. The arm had been amputated in both cases at eight o'clock in the morning: the patients died the following night (*la nuit suivante*).

HYSTERICAL ANÆSTHESIA, ASSOCIATED WITH DYSMENORRHEA.

A case of well-marked *hysteric anæsthesia*, precisely as described by M. Duchenne (p. 172), was noticed at the Metropolitan Dispensary, Cripplegate, within the last few weeks. This affection has been so entirely overlooked up to the present that its characteristics must be of more or less interest to practical men. It might indeed be a question of half speculative interest to ask whether this *hysteric anæsthesia* may depend on some peripheral cause like epilepsy, the ovary as well as the uterus being probably engaged in it. The following is a short outline of the case:

Sarah S., aged 25, has been under treatment for some weeks this year (1859), with, as described

tion marchait bien, il y avait peu de sang écoulé, le pouls était bon, la respiration facile, lorsque tout à coup le malade s'écria, 'Mon sang tombe dans mon corps! je suis mort!' et au même moment il se roidit, perdit connaissance et fut couvert d'une sueur froide. On entendit un bruit étrange dans l'intérieur de la poitrine." The surgeon thought he had opened the *pleura*, but this proved to be not the case; the patient never rallied. On a careful post-mortem a small opening was found in the jugular vein, and the right side of the heart and the cerebral vessels were full of bubbles of air!

in the Dispensary Registration Book, "obstinate and painful obstructive dysmenorrhea;" the poor young woman seems almost never free from pain, which at a specific period every month amounts to the utmost agony; the young woman is unmarried, nor does it seem a case for mechanical or surgical interference, as the symptoms have otherwise improved under a milder kind of treatment. Some of the pain appears to be decidedly of a hysterical nature, and yields in part to the effect of opium, valerian, hyoscyamus; it is curious, however, that though the patient has been a long time under treatment, and the pain has been so excessive that the existence of such a thing as "want of feeling" was never suspected, yet it is present in a very marked degree.

May 23.—In attendance to-day at the dispensary. She complains very much of her usual monthly distress; she appears rather more than usually hysterical, but before giving her a mixture, with chloric æther, opium, &c., the question was casually asked if she had any "numbness" of her limbs, to which she replied that one of her most common annoyances was a feeling of "pins and needles" about the side of her neck, and entire absence of feeling or "numbness" of exactly one-half of her face (the right side); there could be no mistake about this, as one side of her face will bear any amount of pinches or punctures of a pin; but once that the pinching is carried beyond the mesian line, the face exhibits its natural sensibility.

The details of the discovery of this remarkable disease by Duchenne, of Boulogne, and M. Briquet, have been so recently quoted, that we need not again refer to them. We are told that the anæsthesia in

this hysteric form is more common on the left side than the right, in the proportion of 116 cases to 25, or almost 5 to 1; why this should be so is not easy to determine. The trunk was affected in 44 cases, this insensibility occupying the whole of the trunk in 4; but the *left* side in 16, the right in 3. Next, as to the extremities, the upper were affected in 51 cases, both of these in 6; but as before, the *left* in 25, the right in 3 cases. In 24 cases only were the lower limbs affected, the *left* in 10, the right in 3—both in 11; so that in these and a mass of other statistics the anæsthesia of hysteria has a tendency to attack the left side, which cannot be by any means an accident. General anæsthesia of the skin is thus very rare, but unilateral anæsthesia almost the rule; still of the “why or the wherefore” of this rule nothing is known.

The theory hazarded by me as regards the true nature of this disease is founded remotely on the suggestive and original ideas of Dr Brown-Séquard. Of the analogy existing between epilepsy and hysteria, there is, it need hardly be remarked, every day increasing corroborative proof. Of the former disease (epilepsy), depending in a majority of cases on peripheral irritation, every day's experience in hospital practice also affords testimony; so much so, that in a large number of epileptic cases, by destroying this peripheral source of irritation (as in a remarkable case of epilepsy at St Bartholomew's, cured by Mr Lloyd, trephine cases at Guy's by Mr Cock, and in about twenty cases by Brown-Séquard, cured by destroying the peripheral source of irritation by the actual cautery), the real nature of the disease, as due to external causes, was

at once made apparent. The peripheral source of irritation, in this case of hysteric anæsthesia at the Metropolitan Dispensary, is very evidently one of the ovaries. The pain and obstructive irritation at each menstrual period are literally frightful, and not to be endured by the poor girl; the nerves of the ovary and Fallopian tubes being in a state at one time marked "neuralgic" on the dispensary book. The case as regards treatment is only benefited on this view of the case. The use of steel remedies in such cases as this, except carefully guarded by carminatives, is most dangerous, and steel and iodine, when given in dysmenorrhea, are calculated to do more harm than good. It is to Professor Simpson that the more conscientious portion of the Profession are indebted for a knowledge of the true nature of these cases of obstructive dysmenorrhea. Following Dr Mackintosh, of Edinburgh, he has traced them to a strictured or occluded condition of the canal of the cervix; and even in some cases to irritated ovary. Physicians of acknowledged merit now prefer the more calm use of warm hip baths to relax the parts, opium suppositories, the internal use of chloroform, belladonna, &c. The anæsthesia of the *left* side of the body in hysteric cases may be the result of nervous influence near the pyramids, the primary cause being an irritated ovary at the menstrual period, pressed on by that common source of mischief in females, constipated bowels, with distended sigmoid flexure of the colon.

CHLOROFORM IN OPHTHALMIC CASES.

In cases of extraction of cataract, where I observed Mr Wharton Jones operating, I observed that he prefers "*stare super antiquas vias*," to operate without chloroform, a good gush of vitreous humour following the lens, from the spasmodic irritability of the globe from the pain, a thing seldom seen in cataract operations at Moorfields and other hospitals, under the calming influence of the anæsthetic. Mr Wharton Jones objects to chloroform in eye operations, as the surgeon loses the directing power of the patient in turning the eye in whatever direction is necessary; though it is felt by other good surgeons that this advantage, often desirable, is of rather an imaginary kind, as the eye is very manageable when the patient is fully etherised. It has been urged by Mr Haynes Walton that the lens does not roll or bulge out so freely or well under chloroform. This is, perhaps, rather an advantage than otherwise; while in the former objection of the eye not being manageable, when the patient is fully etherised, this is easily obviated, by holding the eye,

as in strabismus, in a forceps by means of its conjunctiva. Indeed, when the eye has been once pierced, be it by needle or knife, the eye is entirely at the command of the surgeon; it is perfectly fixed. If the iris be injured or pressed upon very much, the patient appears to suffer, and under chloroform to vomit. In a hundred cases of extraction and other operations at Guy's, chloroform was found useful; it is used, also, as the rule at Moorfields, nor does it seem that vomiting occurs, or is practically so dangerous as it was supposed to be.

It is generally known that ophthalmic surgery, especially the operations for cataract, were those in which surgeons hesitated a considerable time before they employed chloroform; in the London hospitals, at present, the young men, often of advanced ideas, all use chloroform; but the older ophthalmologists prefer to go on as before its discovery. It is partly true that the extraction of a lens through the cornea is not a very painful operation, but although this may be the fact, yet the apprehension and fear of the operation, on the part of the patient, is almost as bad as if the operation, in its advanced stage of removing the lens, were really painful. It must not be forgotten, however, that the iris, and even the external conjunctiva, are both very sensitive and painful when wounded, as I have also seen more recently in cases of staphyloma, operated on by various surgeons; in glaucoma and iridectomy (page 95), the same sensitiveness is very apparent also.

CHLOROFORM IN MIDWIFERY PRACTICE.

The subject of the use of chloroform in attendance on cases of midwifery is one so essentially of a practical nature that I am inclined here to let theory go on one side. As regards obstetrics, I feel the greater satisfaction at this course, as I am enabled here to reproduce a communication addressed to me by Dr Rigby, in answer to some suggestions and inquiries thrown out by me to him and various other of our leading obstetricians (page 98.)

These general effects of chloroform in midwifery practice, as estimated by the leading obstetricians of Europe, were detailed previously; it was then said that anæsthesia of parturition renders the labour a little slow; I still believe that this lengthening out of natural labour, by some hardly appreciable period or interval, is of no harm as the patient is not suffering in any way; it requires caution, however, not to push the chloroform too far or into the third stage, except in cases of forceps operations, and even here it should not be administered till after the forceps shall have been applied.

Dr Rigby's letter is of such interest that I deem it worthy of being copied here, as far as it bears on

the present branch of this essay. Dr Rigby says: "Having received your queries on the action of chloroform in midwifery, I venture to offer a few remarks on the subject. I may premise the quantity administered at a time to different patients has been as nearly the same as possible, and I have not seen any reason to alter the mode of giving it by a sponge about the size of one's thumb that I adopted shortly after its wonderful powers were first made known by Professor Simpson. I always direct the patient to apply it herself first, in order to give confidence, and to avoid the disposition to gasp and struggle if the sponge is held by another person. In a few moments the hand begins to drop, and it may then be placed on the upper lip, which has been previously well greased with cold cream, and a pocket-handkerchief laid lightly over the face. In natural labour a patient may thus be kept quite sufficiently under the influence of the chloroform for any length of time, and yet be able to hear and answer questions, and thus you, as well as I, frequently hear a patient remark, 'I know I have a pain and yet I do not feel it.'

"That the action of chloroform is considerably modified by certain circumstances and conditions of the system is well known; witness the restlessness and talking too frequently seen in hysteric females; the vomiting, the severe throbbing of the head and 'tinnitus' during the early inhalations, and the intense sick headache and even vomiting which follows the recovery from chloroform where the bowels are loaded or deranged.

"In natural labour, where the pains are strong and quick (especially if it be not her first labour), the chloroform seems to have no other effect than that

of a deadening sensation; the os yields so easily, the head descends quickly, and with so little effort, that one is almost tempted to conclude that the soft parts have been rendered more dilatable by the chloroform. This is the usual action of chloroform in natural labour, when given to a moderate extent, but we meet cases every now and then where it undoubtedly retards labour. For a long time I resolutely doubted this fact."

Here Dr Rigby strives to explain the nervous relations and associations of the nerves and associations of the uterus, as engaged in parturition, and likely to be influenced by chloroform. His views are nearly the same as those given by me before (pp. 74, 104, 122).

"The fact of chloroform," he continues, "being capable of suspending uterine action, even when given in small quantities, is one of sufficient rarity to justify its being looked on almost as an exception to the rule; the unaided uterine contractions are insufficient of themselves to force the presenting part over the perinæum and through the os externum. As long as the patient is under the influence of chloroform she makes no effort, or assists so feebly as to be of no use; but if the chloroform be stopped, the bearing-down efforts again show themselves—they soon become vigorous and active, and the labour is speedily terminated.

"I have no reason to suppose that chloroform, given under proper precautions, can exert any prejudicial influence either on the separation and expulsion of the placenta, or on the recovery of the patient afterwards.

"In severe, and particularly instrumental labours, where the bowels have been carefully regulated, and food not taken shortly before inhalation, ehloroform is undoubtedly as valuable in preserving the patient from the effects of the 'shock' on the nervous system as it is after surgical operations.

"I feel convinced, by ample observations, that when judiciously administered, the prognosis, as regards the patient's recovery after a severe labour, is more favourable where ehloroform has been used, than where it has not been."

These replies to my several questions are very valuable, and very much agree or coincide with my own impressions.

The question has been ably discussed this year (1859) in Paris, whether, in obstetrie praetice generally, chloroform leads to hæmorrhage. M. Liegard, a pupil of Dubois, met two very marked cases of hæmorrhage, but the cause of this accident appears to me on the face of the published report. I believe the reason for the hæmorrhage is evident in the fact that M. Liegard, careful that the beneficial influence of the chloroform should be pushed to its farthest limit, continued to give it, even to the most advanced degree of the third stage. The uterus, so like the heart in many of its ganglionic and muscular arrangements, though excited by chloroform in small doses, loses its contractility as a muscle by large doses, and hæmorrhage follows. M. Danyau, a friend of M. Liegard, by recognising this fact, was able, during the debates of the Medical Society in Paris, to give the result of fifteen cases of midwifery in his practice, all under the protracted

but cautious use of chloroform, but without the slightest hæmorrhage.*

* That there are still differences of opinion as to the value of chloroform is evident from the subjoined debate at the Midwifery Society of Central Germany, which also took place about the same date.—Dr Spiegelberg opened the debate by showing that when chloroform is administered properly it does not delay, weaken, or put off the pains of ordinary labour—nay, the pains return quite regularly again, even if the third stage of narcosis be infringed on. That the voluntary activity of the abdominal forces has disappeared is true enough; but the involuntary action, which alone is quite sufficient, remains unimpaired. A second objection to the use of chloroform is still less founded, viz., that which attributes mischief to the mother consequent on its employment; and by the unprejudiced mind the practice of those who employ chloroform will be found to be more successful than that of those who reject it. As yet no case of death has occurred from its obstetrical employment. Dr Spiegelberg believes that it is admissible, though not necessary in cases of entirely normal labour, and in these he is guided by the wishes of the patient; while in abnormal, and especially in instrumental labour, it is urgently called for when contra-indications do not present themselves. Certainly no innovation in practice of such importance has ever met with such rapid approval as the obstetrical use of chloroform; and a considerable portion of the opposition it has met with has been due to the faulty mode of its employment. To secure its beneficial agency, the patient should be kept in a state of complete repose, and brought at once into

As regards some of the questions thus replied to by Dr Rigby, and previously by Dr Murphy (pp. 75, 122), Dr Tyler Smith advocates the abolition of craniotomy in living children, and agrees with Dr Simpson that "turning" may be performed in cases of moderate pelvic distortion at the full time with comparative safety. "Nothing," he adds, "has ever occurred in the history of turning

a pretty deep state of anæsthesia, no stage of excitement then occurring. Afterwards she should only inhale during the presence of the pains, and to an extent only necessary to relieve these. The simplest form of apparatus should be used, namely, a conically-folded handkerchief.—Dr Schneemann observed that he could not agree in the desirableness of chloroforming in ordinary cases, inasmuch as there was no necessity for it, while he had often observed ill consequences, especially a disturbance in the delivery of the placenta; and, moreover, the maintenance of the anæsthesia is a difficult and time-consuming procedure when no assistant is present.—Dr Birnbaum had never met with any of these ill consequences. He resorted to chloroform in operative midwifery, and in dynamic disturbances when appearing to be dependent upon excitement of the nervous system.—Dr Breslau objected to the giving the chloroform on a handkerchief, because too much is used in this way, and the air of the room becomes impregnated with it. He employs, usually, a caoutchouc bottle, containing a sponge soaked in chloroform.—Dr Birnbaum objected to all such means, for the escape of the chloroform, by due care and the proper folding of the handkerchief, may be prevented.—Dr Spiegelberg observed that although certainly more chloroform is em-

which has so strongly tended to enlarge its usefulness as the introduction of anæsthetics. Under chloroform we can turn with comparative ease in cases of excessive sensibility of the os uteri and vagina; in arm cases in which the waters have been long expelled, and the uterus has closed upon the foetus with spasmodic force, it renders turning practicable, in cases of convulsions or maniacal excitement, and in all instances it makes the uterus

ployed when the handkerchief is used, yet this deserves to be preferred. When an inhaler is used, we cannot, with the same ease as with the handkerchief, follow the various movements of the head. Then again, all these apparatus have something repulsive about them, as they have to be used by one person after another; and it is inconvenient carrying them about one. But the greatest objection is that they cover up the mouth, and sometimes the nose also, which is productive of danger. —Dr Kilian observed, that he employed chloroform in normal labour only in very restless and very sensitive persons, especially in the last stage, when the perinæum is endangered by the restlessness. In operative midwifery, except in the Cæsarian section, when relaxation of the uterus and hæmorrhage are to be feared, and in dynamic disturbances he, at the present time, makes a pretty extensive use of anæsthesia. He only induces the so-called first stage of narcosis by applying a handkerchief to the face, enabling the air as well as the chloroform to come in contact with it, and repeating this with the recurrence of the pain. He has never met with any arrest of uterine activity, or any trouble in the delivery of the placenta.—‘*Monatsch für Geburts.*’ Band xi. pp. 29-34.

quiescent, and thus averts danger depending on resistance or contraction."

In ordinary or natural labour, the chloroform, of course, may be discontinued a few moments before the infant is born. As to the effect of excess of chloroform in all such cases, there is a sort of balancing observable between the reflex nerves as regards the external passages, &c., which are relaxed when the chloroform is pushed into the third stage, or too far, and, on the other hand, a relaxing also on the part of the ganglionic nerves of the uterus itself, which begin at that time to grow weak in their action, so that, though the contraction of the uterus may become more feeble by an overdose, the resistance to be overcome is less also. These are compensating points deserving of notice, as of a practical bearing, as well as the well-known occurrence that a labour may go on to a normal termination in a paraplegic patient, showing thus that the actions of the cerebro-spinal, or voluntary nerves, are very much in abeyance all through this process, acting merely—if they act at all—by helping to co-ordinate the other actions.

Presuming that chloroform be not given so long as the patient bears her pains well, I deem the following directions, nearly in the words of Professor Murphy, of considerable usefulness :

1. Always commence with a dose—about thirty minims. If it agree with the patient no inconvenience is caused, but she will generally complain that it is doing no good ; the quantity may then be increased until, on inhalation, the exhibitor finds he cannot take a full inspiration without cough.

2. In the second stage of labour, chloroform may

be given when the head is approaching the perinæum, or before then if the pains become intolerable. This may be known not merely by their greater intensity while the uterus is in action, but also by the restlessness of the patient in the intervals. She is watchful, dispirited, still crying, but in a more subdued tone.

3. When the head arrives at the perinæum, chloroform may be given in a fuller dose, if it have not already accumulated. The perinæum yields more easily under its influence, and the severity of the pain is controlled without any loss of force. This rule applies especially to cases in which powerful forcing pains are acting against the perinæum at the hazard of its laceration.

4. When operations are necessary, if they are not severe, as, for instance, some forceps operations, chloroform may be given in the same manner as in natural labour: but always after the instrument is applied. If severe, it may be given as in surgical operations, but not to the same extent. Hence an assistant is necessary who is quite conversant with the properties of this anæsthetic. It is obvious that the same person cannot operate and give, simultaneously, the full soporific dose of this agent.

5. The inhaler should be applied to the mouth just before the pain commences, two or three full inspirations taken, and the moment the action of the uterine ceases, it should be withdrawn. The inhaler should never be applied in the interval between the pains.

6. When inhalation has been continued in this interrupted manner for some time, if any alteration be observed in the countenance or manner of the

patient, if the face is flushed or bloated, or tinged with a slight lividity, if she ramble or become hysterical, let the inhaler be withdrawn, and the face of the patient fanned. Wait until the pains return to their original severity before renewing the inhalation, when it is probable that these symptoms will not return.

7. In some instances the patient is very intolerant of her pains, and if given chloroform to relieve them she becomes hysterical, crying perhaps louder than before it was inhaled. In these cases it is better to induce sopor, which may easily be done without stertor. For this purpose a sponge and folded handkerchief, applied to the nostrils, is preferable to the inhaler. Whenever sopor is brought on, the closest attention should be given to the countenance—observe the irritability of the eyelids; to the respiration—notice its frequency, and especially stertor; to the pulse—mark its strength. The handkerchief should always be held at a distance at first, and be gradually brought nearer, but the sponge should never be applied quite close to the nostrils.

It remains only to say, in conclusion, that chloroform and ergot of rye are completely antagonistic in their action on the uterus. Ergot may destroy the child, by a continuous spasmodic grasp that it induces on the foetal vessels,—this is lessened by chloroform. We have, thus, two great instruments if we know how to use them aright—(even in abortion cases, and in retained placenta, chloroform is as valuable as in cases of “turning;”)—two great instruments, if the charity, intelligence, and sense of duty of the practitioner towards his patient are equal to the occasion of using them!

CHLOROFORM IN GENERAL
PRACTICE.—CASES.

" Strange lingering poison :—

————— but there is

No danger in what show of death it makes
More than the locking up the spirits a time
To be more fresh reviving."—CYMBELINE.

CHLOROFORM IN GENERAL PRACTICE.—CASES.

SOME cases in general practice have such an evident bearing on points urged in the previous pages, that little apology may be needed for their insertion. The following case shows that the cause of death is probably of a very *casual* nature, but not to be treated carelessly, nor yet over-treated.

I am not of those who look always only at the dark side of anæsthetics and the risk attending their immensely increasing use at present in hospitals. Deaths may occasionally occur in the best regulated hospitals. We are more and more under the conviction, however, every month that there is a tendency in the Profession generally to look on chloroform as a trivial or exceptional affair or a non-essential, its administration an operation of convenience, like cutting out a Taliacotian nose or shaving the pubis before hernia, that may safely be entrusted to any second year's student, as it very often is done. Many good judges believe that there is more skill

required to administer chloroform than to operate for cataract or stone, and that deaths from chloroform must ultimately become less and less in number, according as patients are previously examined and prepared for this ordeal—examined as to the existence at any time of brain disease or heart affection, and prepared for chloroform by the previous administration of a stimulus in the shape of wine, by the precaution of absence of other food in the stomach, plenty of cold fresh air in the apartment, &c. &c.

It is to be lamented, also, that persons who have probably not seen chloroform administered a dozen times, say, for instance, that it is of no use in midwifery, that it is at best only a temporary fashion in pure surgery that will soon die out, and that any attention given to the matter must be more or less a pure waste of time.

CASE (AMPUTATION) EXHIBITING THE UNCERTAINTIES OF CHLOROFORM.

Case I.—“R. W——,” a fine young man, in robust health previously (one of the most inscrutable things about these deaths from chloroform, as acutely observed by the late Dr Snow), was known about the two borough hospitals as a good deal engaged in the steamers at London Bridge, from which he used to supply jars of sea water from Margate to the hospitals, for the use of some seawater vivariums in these institutions. The poor fellow (and this is essential) was described as the very type of sound health, little more than a month

previously, when in an evil hour one day the foot of his right leg sustained a crash or wrench between two steamers, literally smashing or breaking the ankle, dislocating the astragalus in a most unusual manner, outwards, without fracture of fibula or tibia, and throwing the foot inwards. When admitted to the hospital the surgeon in attendance at once recognised the dislocated astragalus and was preparing his pulleys and means of counter-extension, but it turned out fortunately that by a little skilful manipulation, and relaxing the knee and ankle with the tendo-Achillis, that the bone was easily reduced. The poor fellow was then placed in bed in the hospital and the utmost quietude and rest enjoined.

Misfortunes seldom come alone; we were forcibly reminded of this "wise saw" by this significant instance at the post-mortem examination. All this sad havoc of the bones of the ankle had been partly repaired; the "*Vis Medicatrix*" had been busily at work; the astragalus, though broken or crushed, had evidently been reduced in the best possible manner, but hospital erysipelas, one of the three Fates attending the case, subsequently supervening, necessitated the operation of amputation. It was for this operation that he was being placed under chloroform when he died.

In a case like this, we shall be excused for impressing on our readers a part only of the undefinable sorrow that we felt—almost amounting to dismay—that by some physiological accident, not yet understood, these cases of death from chloroform are ever startling us with their dismal and terrible

details.* In the previous case of death at St Thomas's Hospital, the patient was a mate of a ship who came to have a bad whitlow operated on. We shall never forget the shrieks, and cries, and misery of his children and poor wife who came to look for him. We refer to these things in order that some share of attention be paid to chloroform in our public institutions more than at present. If we go out of our accustomed track, it is because one such harrowing scene as any of those hinted at above—any dismal corpse like the eviscerated and sorrowfully cut-up remains of this poor young man—any mother's heart grieving for the loss of her sole support in the world—any—but why heap up Pelion upon Ossa?—any inseparable misery from sudden death from chloroform ought to convince any conscientious persons that proficiency in the study of anæsthetics is a thing at least not inferior to many others that call down occasionally rumblings of applause in the operating theatre. We feel and write strongly on this subject, as there is a strong party in various parts of the three kingdoms—in Ireland, England, and Scotland—who, partly from knowing nothing whatever of

* It is curious that in 48 deaths described in Paris there were 32 men, and only 16 women! We have had also no deaths in midwifery! The majority of the deaths were sudden, and in the early stages before anæsthesia was established; some of the deaths were like those described from air in the veins. (Page 108.)

anæsthetics, are always ready to condemn them ; whereas the fault is exactly in the opposite direction, that they are not esteemed or tried, or studied sufficiently.

The quantity of chloroform administered in the present instance was very small—about half a drachm. A very remarkable feature in the case also seems to be, that a fortnight previously, when Mr Solly wished for a full examination of the ankle-joint, and found it necessary to gouge away part of the astragalus, the young man remained an entire half hour very fully under the effects of the same chloroform. One writer, curious and paradoxical as it may seem, is inclined to think that during the convulsive action induced in the early stage of the chloroform process, and by small or minimum doses, a trachelismus of the muscles of the neck, larynx, &c., is produced, with engorgement of the heart and syncope. The distended condition of the right side of the heart was very obvious in the present case, even before the pericardium was opened. We may say here that one of the earliest effects of chloroform, when it takes effect in the normal manner, is to produce diminished action of probably the vaso motor nerves ; it is the surest indication of the chloroform beginning to take favourably when, after a lapse of about two or three minutes, the pulse becomes large, soft, and a little more quick, such as from 85 up to 100. An excess of such a condition might go into asphyxia ; but stoppage of the heart's action, as in the present case, would be from congestion of its chambers ; for this condition Dr Brown-Séquard and others have recommended the opening of a vessel like the jugular, and the transfusion of a saline solu-

tion, which has such a remarkable action in the collapse of cholera.

Of the nature of the original accident from which the young man suffered, it is not necessary that we say very much, though the injury was of a very rare kind. When he was brought to the hospital, Mr Sydney Jones, who was in attendance, at once recognised the rounded head and broad articular facet of the astragalus lying on the outside and the foot thrown inwards. Mr Jones anticipated great difficulty in reducing this bone, but was rather taken aback to find that it went in quite easily when the gastrocnemii and tendo-Achillis were relaxed. He was preparing to use chloroform and some other things, but the bone went in of its own accord. Cases of uncomplicated dislocation of the astragalus, we need hardly say, are exceedingly rare, though injuries of the ankle-joint are very common and troublesome, nor is it difficult to understand why injuries of the ankle should be often met with when we consider the enormous force as of a long lever which is brought every hour of the day to bear on the astragalus and arch of the foot. I have seen about half-a-dozen such cases of dislocated astragalus in as many years in the hospitals; a luxation of the astragalus, pure and simple as in the present instance, being in fact a very rare accident indeed. Mr Liston gives one case, but says he never expected to see another, and so of Sir A. Cooper and other surgeons. Dislocations backwards are particularly rare, though such an injury has been seen; here the astragalus is thrown backwards and inwards though the anterior relations of the foot are very little changed, the dislocated bone being, of course,

felt lying between the extremity of the tibia, the tendo-Achillis, and calcaneum; if the latter is broken, too, the heel feels as if hanging off; in the present case, though Mr Solly found it necessary to gouge away some of the neighbouring bone some time after the accident, yet the calcaneum appeared sound, with the exception of the cartilage, which we found at the post-mortem was quite rough and destroyed, probably, from exposure. We saw one case of a very obstinate nature of disease of this bone, and were present when the late Mr Statham literally dragged out the astragalus with the sort of forceps used by gas-fitters, all the common instruments slipping off it like so many pair of tweezers or strong sugar tongs. This is mentioned simply to give an idea of the immense force required to dislocate this bone, even when the bones were prepared for such a luxation by previous chloroform, dissection of ligaments, the disorganising progress of tedious exfoliation in the part, &c. &c.

In conclusion, we may say, when it is remembered that the astragalus is wedged in between the tibia and fibula and entire body above, the calcaneum below, the navicular bone in front, and that it is the pivot, so to say, on which the whole weight of the body sways backwards and forwards in walking, the wonder is ever recurring that it is not more often pushed out of its place, but so it is, and we must recognise the rarity as a fact. A case of dislocation of the astragalus, exactly similar to the present injury, occurred in the practice of Mr Wormald, at St Bartholomew's, about three years ago, and excited immense interest; the anterior aspect of the foot was in this case free from deformity when replaced,

but the thumb could feel the astragalus absent; there did not appear any sign of fracture of tibia or fibula; the foot looked curiously shorter and "crumpled up," like the present case by Mr Solly; the astragalus itself seemed to be crushed, and it had to be gouged or got away, but the man in the end got well, with a very fair foot after the tendo-Achillis had been divided subcutaneously.

We have dwelt thus long on this case, as it seems to be one of a very interesting kind; first as regards the nature of the injury to the astragalus, but more especially in relation to this peculiar accident from chloroform; it seems indeed, as regards the latter, as a sort of "crucial instance," in the quaint language of Bacon, that here we have a man in tolerably fair health, who at the end of July, undergoes a painful operation, fully under the influence of chloroform for a half hour without any perplexity or accident, from fatty heart or over-dose, but who a fortnight later falls dead at the first whiff of the same chloroform, administered in precisely the same manner. This to me, disposes of a great deal that has been written of late, as to over-doses, and the infallibility of tubes and pistons, and shows also that certain views as to the increase of mortality in such painful or grave operations are utterly wide of the mark. In eleven of the fifty cases of death tabulated by Dr Snow, chloroform had also in a similar manner been taken previously with perfect safety; it shows also that "idiosyncrasy," as some authors would lead us to think, has nothing to do with these numerous deaths. It may be said that in the present case the young man's system "went all wrong" after the first operation, consequent on the attack of erysipelas;

but on this point of the system going wrong, as contra-indicating the use of chloroform, every year's experience makes it more clear that it is in persons exactly of this kind, in the 30,000 wounded in the Crimea, and the tens of thousands in our own hospitals where the system goes wrong from wasting sickness, erysipelas, &c., that the administration of chloroform is most successful. The deaths occur proverbially in rude health or the slight cases of strabismus operations or opening of whitlows, in the dentist's chair, or in cases of simple scarification, as in a case of death recently at the Westminster Hospital; the cause of death is obviously of a very casual nature, the death itself very alarming and frightful. We must take care not to measure one by the other, and not to do too much. In typhus of a bad kind, several physicians would still bleed largely in quarts or pints, and, according as the typhus is very bad, the legends of the old Battle Bridge Hospital remain, to bleed more and more. The patient had indeed a battle with the lancet; it never occurred that all such patients would recover perfectly if left alone, and so of many accidents from chloroform. A candle flame burning low has been blown out; by skill and rule of art it may be blown in again; there must, however, be no violence if we are to succeed, nor must we leave the entire subject of chloroform to nurses and students. The patient is lost, perhaps, in few instances by excessive doses; he sinks rather because our means of resuscitation are wrong or imperfect.

The young man in the present case evidently died by syncope. Having been placed in the proper situation on the operating table for amputation of

the leg, it was suddenly remarked about a minute after the chloroform process had commenced that signs appeared, the result of fear or emotional depression, for he was not yet unconscious. This emotional depression, it has been pointed out (page 30), precedes or leads occasionally to irregular action of the heart and syncope, showing the wisdom of the plan of putting the patient under chloroform in his bed in the quietness of his ward before he is brought into the theatric glare and display of the operating room. Others, standing by during the administration of the anæsthetic, were at once attracted by the unusual appearance of the man, but almost at the same instant the house-surgeon, who was giving the chloroform, and had not poured more than about a small drachm into the usual silver inhaler, cried out that something was wrong. The pulse had stopped, the man's face changed, in a word, he was dead.*

Judging from the post-mortem appearance, we would not in this case have had recourse to the Marshall Hall "ready method," as it is styled, which was at once commenced, with ammonia to the nostrils, &c.; the flickering spark of a blown out candle is to be blown suddenly in, not smothered. Galvanism to the nape of the neck; something better was tried, and an injection of brandy and warm water was thrown into the rectum, but not the slightest effect seemed to result—"magna inter opes

* Several similar facts to that stated by M. Pirogoff (page 121), as to the effect of emotion on soldiers, in preventing chloroform acting in a normal manner, have been given by M. Vronneau, as occurring in the army of Italy, amongst the wounded.

inops;" it was now decided that the poor fellow was indeed gone beyond all art, and so it proved. I watched the post-mortem examination next day with much interest, coupling it with various other necropsies of like kind after chloroform. We should say, however, if one had previously known that the middle lobe of the brain was in the condition found, together with the heart much entangled in its action by fat, we should have been slow to recommend the chloroform.

Post-mortem Examination.—This examination took place twenty-four hours after death. The expression of the face was remarkably calm; there was nothing at all like the congestion of asphyxia. Even the dead-house servant men, rather a flinty race, could remark how like sleep the death was. There was no rigor mortis; of no trace the remotest kind that any struggle had occurred, a simple something had gone wrong, leaving the remaining part of the vital machinery like a clock that had gone down.

The muscles of the chest were quite beautiful for their healthfulness, and when the chest and abdomen were opened their perfectly normal aspect was generally observed. On more intimate inspection, however, we found the liver enlarged (four and a half pounds) and particularly towards its convex aspect, where it pressed up the diaphragm; the heart also, as previously said, seemed to distend the pericardium, the auricle and cavæ in front being very prominent; the head, which had not yet been opened, was now examined; there were some few adhesions of the dura mater, and a considerable quantity of fluid in the other membranes, and in the ventricles; the scalp was particularly free of blood,

nor was there any sign of congestion of the sinuses or veins, but rather an opposite state ; the most remarkable thing in the post mortem was a cyst-like body or old apoplectic clot the size of half a walnut kernel situated in the middle lobe of the brain, pressing on, and entirely obliterating the olfactory bulb at one side, and obscuring or destroying the substantia perforata as it is called, from which that nerve issues adjoining the optic commissure ; the heart was rather large, with some fat on it, but not at all an unhealthy organ.

DISLOCATIONS OF THE ANKLE—HOW ARE THEY
TO BE TREATED ? WITH OR WITHOUT CHLO-
FORM ?

The following is a case of dislocation of the astragalus in an opposite direction—viz., inwards—to the dislocation outwards recently given. If we bring these cases so prominently forward, it is because a controversy has existed for some short time in the hospitals as to whether in these and such like accidents it is more desirable to divide certain tendons—whether it is better practice to take off the tension of the muscles and muscular attachments by means of cutting tendons, or to take off this tension by placing the patient fully under the influence of chloroform. Some surgeons advise one ; other surgeons, advise another.

At Guy's Hospital, Mr Hilton and some of the surgeons are in favour of the cautious but steady administration of chloroform, which seems to answer every purpose ; it requires care, of course, as many of these cases of smashed ankle and broken legs, of dislocations and fractured elbows, occur in very bad

subjects, as in a case brought into St George's, where the man was in bad delirium tremens and drunk. In some of these cases, as in more than one seen at St Bartholomew's, and in several at Guy's, of "fractures and dislocations about the ankle;" in all of the latter, in fact, the gastrocnemius tendon was divided. In some cases also at the Middlesex and Charing-cross Hospitals the routine old plan was observed to divide the parts freely. In fourteen cases recorded by Sir A. Cooper reduction by ordinary measures was effected in only three instances, and all the remainder would naturally have been given up to the use of pulleys and cutting operations. Many such patients, of course, lost their foot, and some lost their lives, as bad sloughing wounds, especially in oldish patients, occasionally took place, requiring as bad secondary amputations.

All this is now beginning to be very much changed, as it is found that on placing the patient fully under the influence of chloroform or ether, the muscles and their aponeurotic investments are quite as effectually relaxed as by the cutting operation of dividing the tendons.* Some hospital men, of

* If stress is laid so often on the necessity of the safe use of chloroform, it is that one feels that the chief or only drawback to the more general reception of such invaluable agents in general surgery is the acknowledged fact of the risk attending their unskilful administration; yet this, after all, is not very great. When we remember that in all the fifteen hospitals of London chloroform is applied over a thousand times each year—and three or four deaths a-year is considered, and rightly considered, very

course, are very slow to go out of their old groove of tendon cutting : still the practice is a bad one.

The cases of injuries of the ankle are so common, especially in the country in the shooting season and in harvesting, that we deem this class of cases very practical in their nature.

The patient in the case under the care of Mr Hilton was engaged in some amusement of this kind—jumping, which caused a dislocation of a bad kind of the astragalus inwards. An effort was made to reduce the foot by the surgeon, who first saw the case, but it was unavailing. It was then a question of tenotomy or chloroform, and Mr Hilton recommended the latter. Under the influence of the

alarming—the dangers are no doubt very considerable, looked at in a near and familiar way ; but still we must place against such facts the other incident that chloroform in the Crimea was unattended by accident. Yet it is quite possible that the source of mischief may have been in many of the past cases of death by chloroform of the most trivial and casual nature. This gives us good hope for the future, more especially when we understand some certain modes of resuscitation or reviving patients. If my advice has been, when dangerous syncope threatens, to do not too much, if we say—no roughness

“ With gentle hand

Touch—for there is a spirit in the — ”

it is with the conviction that with skill and caution some of such patients may be called back to life. The utmost collectedness and coolness are required. Plenty of fresh air fanned on the face will by itself often effect miracles.

anæsthetic the tension of the muscles soon gave way, the gastrocnemius became relaxed, and the reduction of the dislocated foot was effected without much difficulty. If this had not succeeded it was intended to divide the tendo-Achillis; but in dislocations of the astragalus—pure and simple—the rarest of all rare accidents, the grave alternative of dividing the tibialis posticus tendon is occasionally proposed. The patient got on extremely well in the present case after the use of the chloroform—and it is a practice Mr Hilton strongly recommends. Let us now contrast this case with one of a like kind that fell under notice in St George's Hospital.

A man was admitted into St George's Hospital about the same time, under the care of Mr Pollock. An extensive lacerated wound occupied the back part of the left leg; the left foot was distorted; there was slight bruising of the shin over the instep, and a considerable prominence of bone on the outer side; the foot was inverted, so that the sole was turned inwards and the outer border was turned downwards; the internal malleolus was bruised in the soft tissues by the side of the foot, but the external malleolus was very prominent. Attempts were made to reduce the dislocation, which was apparently that of the calcaneum and scaphoid inwards upon the astragalus. Extension was made by drawing on the foot, the leg being firmly held, with the knee well bent, but no impression was made on the parts. Here Mr Hilton would have used chloroform, but Mr Pollock decided to divide the tendo-Achillis. Immediately the latter was effected the reduction of the dislocated bones was effected almost in an instant. This patient, however, died a few days after, probably of the

shock of the accident, together with the injury to the tendons, and certain nervous symptoms he was labouring under. We do not say that such cases are not exceptional, but if the patient after the chloroform had died, it would have been, probably, condemned. Mr Poland has given the notes of a similar case at Guy's. In the golden era before chloroform, all attempts at reduction failed; terrible sloughing set in from the mechanical use of pulleys, the dislocated bone became exposed, and the patient rapidly sunk and died; the tendon of the tibialis posticus was found running in front of the neck of the astragalus!

LACERATION OF THE SOFT PALATE : COMPLETE
UNION.

The following case, which was recently under the care of Mr Adams and Mr Ward, in the London Hospital, is very deserving of notice, in connexion with the operation of staphyloraphy, or cleft palate.

A little boy, aged three years, was admitted under the care of Mr Adams, having a short time previously fallen down stairs with a long piece of wood in his hand. When picked up the stick was found implanted in the mouth, and on its removal the mother detected that it had severely injured it. Mr Ward, who was in the hospital at the time, was called to the case, and found nearly the entire of the soft palate detached from its connexion to the bone, and resting like a loose flap on the tongue; the only portion that had not been severed was about a quarter inch broad, and just above the right tonsil. From this point, the rent in the palate extended in a somewhat arched manner along the

back part of the hard palate as far as the middle of the left palato glossus ; the circumference of the detached part was somewhat convex and irregular in outline, and here and there jagged. The child was blanched, but the bleeding, which had been profuse, had ceased on his admission. The little creature was placed under the influence of chloroform, though at first it was thought it would be hazardous to render him insensible, for fear of the bleeding getting into the lungs. As chloroform, however, is resorted to every day in dentists' practice without any evil result from the blood getting into the fauces, it was decided that there would probably be no reason for alarm ; the result proved that the conjecture of Mr Ward was right. The fact that chloroform is almost invariably successful and useful amongst children, was further encouraging, and additionally satisfactory.

An operation almost identical with staphyloraphy was then performed ; the several minute portions of the raw surface of the torn palate were, after some considerable exertion, brought into accurate apposition with the part from which they had been torn. Four sutures, one of them being silver, the other three silk (the latter passed through a loop and tied by a slip knot), were successively passed while the child was fully under the chloroform. Ice was then given to suck in minute fragments, and fluid nutritious diet prescribed ; the silken threads were removed on the third and fifth days, the silver one on the fifteenth, when it was found that the most perfect cure had been the result. Mr Adams and Mr Ward both speak of this case as one of very great interest, as without the administration of chloroform nothing

could have been done: the youth and restlessness of the child would have prevented any attempt being made to bring the parts together. If time had been lost, the loose flap of flesh hanging into the mouth would have sloughed off. Phagædænic ulceration and destruction of the bones of the nose and palate might have followed, or erysipelas might have spread over the head, and if death did not follow, the child would have grown up with an ugly and hideous gap in its palate, worse than cleft palate, because less amenable to treatment.

We believe, in cases of this kind, and in those painful instances of cleft palate that we meet in general practice, the use of ice and chloroform will be found of great value. In cases of cleft palate in children, there is, perhaps, no more serious question in the whole circle of surgery than to decide at what age cleft palate ought to be attempted to be remedied by a plastic operation. If done early under ice and chloroform, the patient may get on very well, as in the present instance; but if not done early the child may grow up idiotic from an inability to use his voice, and consequently from absence of education.

CASES OF TETANUS CURED BY CHLOROFORM— BEST MODE OF ADMINISTRATION.

It is very gratifying to be able occasionally to watch cases of tetanus that recover under the use of chloroform, the result of all other plans of treatment has proved so uniformly discouraging. Chloroform is, however, only an auxiliary, though a most valuable one to other such plans of cure, and as such it has

been recommended by over a dozen of the chief surgeons on the Continent.

A case was given this year, in the hospital at Milan, (where so many bad gun-shot wounds have followed the recent battles) of well-marked traumatic tetanus cured by chloroform. At first the patient was ordered six inhalations a day without much amelioration for about ten days; then, signs of improvement becoming apparent, the chloroform was given only every six hours, and, after awhile, three times and twice daily. This patient recovered perfectly.

I mentioned a case some time since where Mr Skey administered more than a pint of chloroform in a case. Immense doses of chloroform have been used in tetanus under the idea that, by blotting out the disease, as it were, by deep anæsthesia, the spasms and agony would not return. A patient has thus been kept three entire days anæsthetic, and relieved from the tetanic symptoms, but he has ultimately died of the combined effect of the starvation thus induced and the tetanus. Chloroform is clearly only an auxiliary, as just said, one no doubt of very great value but to be used with caution.

The relief afforded to patients' sufferings in tetanus by chloroform is immense; were there no other reason for the administration of this agent in this disease this would be sufficient to the mind of the surgeon of feeling and experience—but it does more, it allows the brain certain intervals of rest which, if not equal to actual sleep, are at least a happy release from the sleeplessness, "shock," and exhaustion of the malady. The chloroform takes off the spasm of the jaw in trismus, and thus permits the exhibition of medicines, such as stimulants, nutrients, wine, &c.,

on which the chances of cure very essentially depend. The best statistical returns recently published on the subject of tetanus are certain collections of cases in "Guy's Hospital Reports," and the only conclusion to be drawn from this vast number of cases is the unsatisfactory one, that all plans of medical treatment are alike of little avail except the plan by administration of stimulants and nutritious food. The use of nutritious food, such as beef-tea, milk, wine, brandy, &c., has hitherto been prevented or interrupted by the jaw being locked and by the terrible spasm that follows the effort of deglutition. Tetanus, no doubt, is very often but ~~the~~ outward and manifest sign of an inner and deeper disease of the system, and while this lasts the spasm of the jaw is slow to yield; ehloroform, however, relaxes this spasm, and it is a curious fact that, amongst a collection of old cases of tetanus, published twenty years before the modern introduction of ehloroform and ether as anæsthetics,—a very marked ease of tetanus is given where a patient was allowed to inhale plentifully of the vapour of ether and recovered.* Of the pathol-

* Chloroform, according to Dr Brown-Séquard, is an irritant or stimulant of great power; "it kills," he says, "by irritating the *par vagum* in the lungs, and by a reflex action stops the motion of the heart." Chloroform is now used so largely that Dr Simpson consumes about eight gallons of it every year! One writer has strongly enforced the necessity of not using too much cold sprinkling of water where death from ehloroform is impending, as of thirty-three persons experimented on by Dr Brown-Séquard, he found that in twenty-seven the death

ogy of tetanus we know only very little ; it is said, that idiopathic tetanus is almost constantly endemic in South America, and I have been assured it is there regarded as a fever and readily cured when treated like typhus ; I have also known a singular occurrence

was chiefly caused by diminution of temperature and stimulus ; the warm glow of life goes out and cannot be lighted up again ; pressure on the chest and precordial region, so as to encourage the action of the heart, is now strongly advised in place of too much cold sprinkling. With all precautions, we regret to have to chronicle the fact that another death from chloroform has been notified as occurring at Bonn-on-the-Rhine ; it was a death probably from asphyxia or fit rather than syncope, and was very similar to, if not identical with, a death that occurred, a year or two ago, to Mr Simon, at St Thomas's Hospital.

The patient was a student (in that great town of students), of strong constitution, but who was very much given to drink beer ; the operation was the removal of a cicatrix on the forehead ; he took two doses of chloroform very well, but after a third dose he became excited as in the second stage of chloroform, his face became congested ; he said a few words, then fell as if into a profound collapse ; his cheeks then became pale, he snored three times, and then fell dead. All this occurred in ten to twelve seconds ! At the autopsy the vessels of the head were found gorged with black blood, the heart was pale and empty, and the cavæ contained abundant clots. He had taken about twenty-three grammes of chloroform (3vi.), and it seems to have been given in a very concentrated form on a handkerchief by some inexperienced student.

where half a dozen bricklayers and their labourers were at work in a very bad sewer, and three of the latter were brought to hospital all labouring under idiopathic tetanus. Mr Curling states, that in tetanus where careful post-mortem examinations were made, he found inflamed and healthy spots alternately on the large nerves with tumefaction and redness propagated along the injured nerve to the spinal cord; a fact also stated by some good observers in Germany and France. Some surgeons recommend topical treatment to remedy this state of the nerves, others look on the constitutional treatment of such cases, by stimulants, quinine, phosphate of iron, chloroform, &c., as more valuable. The following case, by Mr Critchett, is one I have seen with much gratification.

A boy of healthy appearance was admitted into the London Hospital under the care of Mr Critchett about the middle of August this year (1859); it was said that he had fallen and hurt his back on the day previous. Symptoms of undoubted trismus were already present when he was admitted; there were no traces of external bruise or cut, except a slight abrasion or bruise on the back.

On Mr Critchett's usual visiting day, four days after, the tetanus was still present, though it had not increased in severity during the preceding forty-eight hours; the abdomen, as usual in such cases, was as hard as a board; the limbs were rigid, the lock-jaw unchanged; slight tetanic spasms occurred every five or six minutes; in fact all the usual signs of tetanus were present in a degree to cause much anxiety. The treatment adopted consisted of the use of stimulants, as recommended at Guy's

Hospital, together with hemlock and chloroform by inhalation; the latter seemed to afford great relief, the boy going quietly to sleep and his jaw becoming relaxed when nourishment was given. His recovery was quite satisfactory.

EXTIRPATION OF THE GLOBE OF THE EYE.

We observed Mr Holmes Coote performing the operation of extirpation of the globe of the eye, at St Bartholomew's, on the operating day at the hospital. This operation has been performed so frequently during the last three years, and with such good results, that we are inclined to place it now amongst the recognised new appliances of ophthalmic surgery. It would be unfair to be any longer routine advocates of little "niggling" operations, in place of this operation, in bad forms of staphyloma, more especially for the working classes, where there is such an admirable alternative as extirpation of the globe and an accurate artificial eye in place of the unsatisfactory operations of a few years ago, and a hideous eye. And why single out the "working" classes? some one may say; but the reason is obvious. We fear, and know, in search of pure ophthalmological pathology—a thing we very religiously dislike—this reason, for the operation is often lost sight of. A poor young man and poor young woman who comes month after month or year after year to one of our centric or eccentric small institutions with a rare specimen of curious staphyloma which is nicked and notched, or a glaucoma on which "Græfe's operation" is not tried, may go on from year's end to year's end a very in-

teresting invalid but incurable. He may, by extirpation of the globe in one case and iridectomy in the other, be restored to the society of his friends quite a new being, and rendered capable of going out into the world to earn his livelihood. This, in a word, is what we so much incline to in the operation so simplified under chloroform, and with the use of the invaluable speculum of Mr Critchett, an operation of *convenience* if you will, but one that satisfies the patient very much.

The poor young man, the patient in the present case, presented, as usual, a very unsightly appearance. In addition to appearing with one eye thoroughly disorganised and converted into an ugly puckered horny substance, he began to experience severe pain with dimness of vision in the second eye and that side of the forehead, which distressed him much; it was to remove this source of pain and the chances of further mischief in the sound eye, which might endanger its existence and usefulness, that Mr Coote, acting in conjunction with his steady and able colleague Mr Lawrence, proposed "extirpation." Of Mr Lawrence we may say, that he is not at all quick to adopt improvements in surgery if they be not shown to be improvements. He has accordingly examined this subject of "extirpation of the globe" so ably brought forward by Mr Critchett, and though it be one of the things "not dreamt of in the philosophy" of his early days, or that of the eye surgery of his contemporaries Tyrrell, Dalrymple, Alexander, Mackenzie, &c., he is yet one of the warmest advocates for its adoption. The operation in the present case was performed exactly as described by Mr Critchett. The patient having

been prepared beforehand was placed under the effects of chloroform; some alarm was excited incidentally as the lad seemed to take the chloroform very badly; his pulse seemed to get quick, and he began to blow and cry in a very unaccountable manner, and to plunge. Mr Coote seemed inclined to dread the anæsthetic, but the chloroform was gone on with and increased, when the lad fell off in a state of deep but normal anæsthesia; the eye speculum was now introduced, the conjunctival covering of the eye divided quickly, the globe of the eye rapidly dissected out and removed. The lad did not appear to suffer very much, and hæmorrhage, as usual, was removed or restrained by a stream of cold water from a sponge poured in the orbit, pressure of course not being very available or advisable where parts so near the brain as the root of the optic nerve are involved. An artificial eye perfected the cure, nor need the lad fear those jocose and very absurd objections recently raised to artificial eyes.

"The reason why" a staphylomatous or disorganized or painful eye acting as a foreign body in one orbit, or at one side of the head, tends to produce pain and disorganisation in the orbit at the opposite side is now rather a well recognised clinical fact, than a thing very satisfactorily settled by demonstration. Dr Brown-Séquard explains many analogous actions to this one by the phenomena of reflex influences.* One hand plunged into ice

* The fashionable doctrine at present (see an article in 'Blackwood's Magazine' for September, 1859) seems to be that all nervous actions are of a

cold water soon displays reflex phenomena in the opposite hand ; a blister applied over a painful or diseased lung or diseased joint, removes such pain, or disease, by setting up a new reflex surface not so sensitive, to which such morbid sensations are reflected :—the diseased action in the lung or joint is baulked, so to speak, and cured ! A staphylomatous globe, or one containing spicula of bone, sets up reflex irritation, which becomes diffused to the opposite globe according as the diseased eye becomes more and more incapable of receiving irritation itself, extirpation of the diseased globe and chloroform at last coming to destroy the circle of diseased action.

4

VESICO-VAGINAL FISTULA OPERATIONS. — OUGHT
OPIUM OR APERIENTS TO BE USED ?

I have seen two cases where the vesico-vaginal fistula operation of Mr Baker Brown has failed, but not in the hands of that expert operator himself. One a case sent up from the country to Mr Fergusson ; the second a woman, under the care of Mr Simon at St Thomas's, who had returned to the hospital to be examined a month after leaving that institution, as it was believed, perfectly cured, but where Mr Simon, a little to his dismay, found that there was still a "small oblique open-

reflex kind ! This article, we have reason to know, is written by a gentleman (one of the few in London) who have carefully inspected and studied the wonderful preparations of Mr Lockart Clarke, Owsjan-nikow, Jacobowitch, Brown-Séquard : his views are very remarkable.

ing passing from before backwards towards the uterus." The case where we saw Mr Fergusson operating a short time ago had been operated on, we believe, several times by one of our most leading provincial surgeons, but all to no avail, so really difficult is it to cure any of these cases without the most extensive experience of their vast variety and a ready familiarity with half a hundred small items of detail. In London one can almost at a glance tell the cases that will do well and those that will eventuate in disappointment. In the last case where Mr Baker Brown operated, we were interested to find that he had struck out recently a still nicer thing than the "split shot" for securing the threads of suture; the previously bad and clumsy method of passing the silver threads (still used in the other hospitals) is rendered now neat and perfect, and the operation altogether in Mr Brown's hands appears to be as perfect as anything of the kind can possibly be. Exception has been taken of late to the free use of opium or chloroform after this operation and aperients have been suggested, but we should tremble for the result of this change, or any change at present, on the old but homely plea of "letting well alone." We can almost at a glance tell the cases that will do well and those that will end in disappointment, as just said, but the latter are usually those cases where the "petits soins," after the operation insisted on so wisely by Mr Brown, are set at nought or not known sufficiently to secure their adoption.

In one of the two cases now under consideration (we do not say which, but in one of them), following this plan of leaving out chloroform and opium—

simple lookers on, should have been amazed if the operation had succeeded. The mere fact of surgeons seeming astonished, and boasting that a perfect cure has been performed, but "*surgit amari aliquid*" there remained yet a slight stillicidium and a not slight but very big hole yet unhealed, through which a sound is passed from the urethra, always confirms us in our impression that such a surgeon cannot have seen much of these cases.

I believe it is correct to say, that all these cases, if operated on even in the roughest and worst manner, will result in a closure of four fifths of the large opening between the bladder and vagina almost as readily as a hare-lip will close. The great secret and the chief skill worth anything is to prevent and occlude this "small oblique opening passing from before backwards towards the uterus from the bladder," as seen in this case under the care of Mr Simon. So well recognised is this fact now, that it has been mooted by good surgeons to make two parts of the operation as in some analogous operations for closing up fistulous openings connected with the bowel from gun-shot wound: viz., to close up the larger part of the rent at first in any manner most convenient, even without chloroform and with alteratives and purgatives—but then a month after to come at the second part and with a catheter and india-rubber bag constantly in use to direct away the current of the urine and establish a sort of substitute for the natural bladder, and, in a word, to perform or finish the operation in the manner, by chloroform, laid down by Mr Baker Brown.

The following is a short outline of one of the present cases :

E. G., married, aged 43, was admitted into St Thomas's Hospital the first time early in the present year, under the care of Mr Simon.

Her history is almost identical with that of nearly all the cases of this class ; she is forty-three years of age, she has had four children, and has had usually very difficult labours, requiring instrumental assistance ; her account is, of course, mixed up with a little of the marvellous, but one can eliminate some essential facts, such as that she laboured some little time before under most agonising distension of the vesica, and that this viscus gave way into the vagina.

Some time after her third confinement, she says, she began to have pains one day in the hypogastric region, with much desire to pass water but great difficulty in doing so ; "the next day she became much worse," says the report of the hospital book, "and continued to be so for a week, her abdomen (the region of the bladder) increasing in size immensely, so that at times she was in a state of extreme agony. She was ordered a warm bath, but a catheter was never suggested ! The pain became then unbearable, the bladder gave way, and a copious gush of urine came from the vagina, about a gallon, according to her statement." Various anodynes were tried,—the pain at length yielded, but now she found that her urine constantly dribbled away ; in this miserable condition pregnancy again appeared, and delivery of a dead child through a vagina, one side of it torn and communicating with the bladder, followed next with a scene of horrors that must be

conceived but not described, but which led of course directly to the condition of her vagina and bladder when she entered the hospital.

To revert, therefore, to the plain prose of the hospital book, we next find that on admission "she appeared out of spirits." As well the poor creature may have done, she says she has lost flesh. The urine trickling away, was first examined by the microscope, but was found to be healthy. A sound was next passed by the urethra into the bladder, and by passing the finger up the vagina, the instrument was felt through the fistula. This exploration we may say, in passing, was also performed by Mr Fergusson, in his case,—though, as a general rule, the educated eye almost always detects the spot from which the uneasing dribble of urine takes place. "The fistula was situated," as one would have expected, high up, "close to the anterior lip of the os uteri"—the point of least resistance, probably, for an over-distended bladder, as a point close to this is the spot of least resistance for opening of collections of pus, recently described by Simpson as taking place in inflammations of the pelvic fasciæ.

April 7th, 1859. — The operation to-day was performed. No chloroform was used, though if there be any class of patients where it has been found most safe and valuable, it is this class. The woman was placed on her side—a most inconvenient position—and a speculum(!) having been introduced, a complete ring of membrane, including part of the os uteri, was removed from round the fistula; a sufficient number of silver sutures were now successively passed, and the fistulous aperture was completely closed. A catheter was next passed into the bladder,

and fastened there: she was put to bed and directed to lie on her left side; there was a good deal of pain in the uterine region during the rest of the day; and in place of Mr Brown's 2 grains of opium, and 1 grain every four hours after, Mr Simon preferred the milder alternative of 30 minims of laudanum in a little plain water.

Next day (8th) the report states she was feverish from the tr. opii., and has considerable pain in the parts. She takes her food.

12th.—Five days from operation; began to menstruate to-day—not a very fortunate occurrence.

16th.—An enema ordered to-day, which, however, did not act on the bowels; the catheter has been changed for another.

21st.—The sutures (now a fortnight from the operation) were removed to-day, and the aperture appeared closed.

22nd.—There is still incontinence of urine, depending, as Mr Simon explained it, on the fact that the urethra has not recovered its tone, after having had a catheter in it so long.

She left the hospital May 7, with a little dribbling away of urine still present. She returned, however, as said already, a month after, when a small oblique fistula was discovered passing backwards towards the neck of the uterus.

DIPHThERITIC DYSENTERY ?

A very remarkable case of what may be termed diphtheritic dysentery of a chronic kind, under treatment at the Metropolitan Dispensary for some months, recently terminated in death by exhaus-

tion, preceded by the most frightful condition of emaciation and some symptoms of irritant poisoning, if taken alone and separate from the rest of the case and its symptoms.

The previous history of the case spreads over a long interval of three or four years, during which time the poor lady (for she belonged to the better-conditioned classes at one time, and had got poor by her continued ailments), had been a constant source of anxiety to her friends. Her first ailings commenced in the stomach, and for this gastric irritation and diarrhœa she had been tickled by the name of a now forgotten, and deservedly forgotten, romance, styled 'The Stomach and its Difficulties,' and had been a patient of the Author of that erudite chrouicle, but still she did not seem to get better.

Early last winter, she came under treatment at the Metropolitan Dispensary, for what proved to be one of the most violent attacks of dysentery that we ever remember to have seen or read of. She was not at that time altered in appearance very much, and it was difficult to reconcile her appearance with the description given by her mother, who attended her carefully, of the continuous sickness her daughter was afflicted with; the incessant rush of slime and blood in pailfuls each day passed from the bowels; the agonising tenesmus and misery she endured; the films of diphtheritic matter like flesh voided, with pain and faintings and exhaustion, almost beyond endurance. Many of the old-fashioned remedies for diarrhœa or stomach disease—chalk, bismuth, catechu, &c.—had been tried in vain. It was too plain, however, to the physicians that it was now the large intestine and its difficulties they had to contend with.

I tried various plans and suggestions, thrown out by my colleagues on the case ;—chalk mixtures seemed of no use ; the acid astringent mixture at the Dispensary, which answers in a small per centage of cases of common diarrhœa, only made things worse ; and if we refer to the case so prominently it is to say that nothing seemed to touch the case at all, or afford relief but pretty largish doses of sulphate of copper, in form of pill with opium, and small doses of chloroform internally.

R_x—Sulph. cupri. gr. iii.

Pulv. opii. gr. ii.

Ft. pil. vi.

Cap. i.—Pro re nata, modo dicto.

The disease, in fact, could be always kept in check by means of these pills, aided by the use of effervescing draughts, chloroform, ammonia and bark, beef-tea and brandy ; whereas chalk, catechu, bismuth, grey powder, or opium alone as invariably did mischief. A strong hope was two or three times entertained that a final cure of the case would be the result as the disease more than once entirely disappeared, and the poor creature was arranging with her husband and friends a journey to the sea-side for change of air in July.

A curious diphtheritic exudation about that time appeared, however, to spread to the lips and mouth and a tough membranous phlegm was obliged to be pulled in strings out of the pharynx by her nurse and mother ; this exudation, which was not at all of an aphthous description, seemed unfortunately to destroy all zest for food, and in an evil hour she began to eat such things as salt herrings, radishes, decayed cheese, unripe apples, and brown bran

biscuits, anything that would scrape the chamois leather exudation off her mouth and lips. Borax and Bretonneau's hydrochloric acid and honey to the mouth were tried alternately with good results; but the membrane had evidently invaded the bronchial tubes and probably the intestinal track, and frustrated all the best concerted measures taken for her recovery; portentous emaciation and dulness over the chest set in about August; her skin lost the healthy Rubens tint of a woman's skin; it was painful now, in fact, to contrast her face and skin with that of her sister (a skin the type of perfect health), a married woman, of about the same age, who visited her. The bowels had for several weeks regained their healthy condition, notwithstanding the dreadful trash the poor creature, against all entreaties, managed to swallow; the skin assumed a dark appearance, and felt clammy and cold. The diphtheritic exudation on the lips, roof of the mouth and pharynx did not seem to abate, and was a source of much anxiety to those in attendance, as it was very nearly choking her more than once; some sickness of stomach persisted, and it was supposed, but not very well made out, that she may have been pregnant.

The case gradually got worse from this time. The bowels were now confined, and the evacuations natural; both lungs became solidified, however, and she died of exhaustion like a candle dying out.

We look upon this case as of interest, chiefly as showing that dysentery and diphtheria may co-exist for a long time; the former spreading over a term of several months off and on, and in some of the phases of this combination we may have symptoms

resembling those of irritant medicines or poisons, probably the result of bile or other fluids irritating an already ulcerated surface in the intestine.

In the next place we entertain no doubt whatever that bismuth, nitrate of silver, and even grey powder, aggravate such ailments to a frightful extent. Grey powder, we believe, the worst of the three, probably by pouring a current of unchanged bile through the small intestines on to the ulcerated surface of the head of the colon, or transverse colon; whereas sulphate of copper and opium seem to have an opposite effect — to set up a new action in the intestine; and only second to these is the use of chloroform internally, or chloric æther.

